March 10, 1958

Paper Trade Journal

Totally Enclosed Hood Pays for Self in Year

Time for Fresh Look at Our Processing Methods

Economics of Various Pulping Processes

Theory and Mechanics of Stock Refining

Thickening Groundwood to High Densities

Knowlton Brothers Marks 150 Years

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Ann Arbor, Mich.

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...technical service is yours for the asking

When production problems demand the help of the best technical specialists, Gottesman customers know where to turn. Technicians on the staff of our pulp suppliers stand ready to assist our customers. It's one of many "fine points" of service we provide because we know what's important in pulp.

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Established 1886

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WOOD PULP

PULP PAPER EXPORT CNC

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Example: Scale build-up in the main water supply line of a major Midwestern plant had reduced the "C" factor from 105 to 72. This situation became apparent just at the start of the peak season for the company. Management had a choice between laying an auxiliary line or trying to clean their present one. They decided to clean the line—but not the old-fashioned mechanical way. Time would not permit. Dowell was called in to do the job—chemically.

Dowell Service was fast—the job was done in three days. Dowell Service was effective—the "C" factor was increased to 92. Dowell Service was profitable for the customer—$71,000 was saved and the company's annual profit was protected.

With Dowell Service you receive the benefits of more than fifteen years experience in chemical cleaning—plus a full line of equipment, chemicals, and trained personnel. You pay one charge, get an efficient job, handled by experienced people.

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Chemical cleaning service for industry DOWELL

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Keep Your Best Formation on the Wire Automatically!

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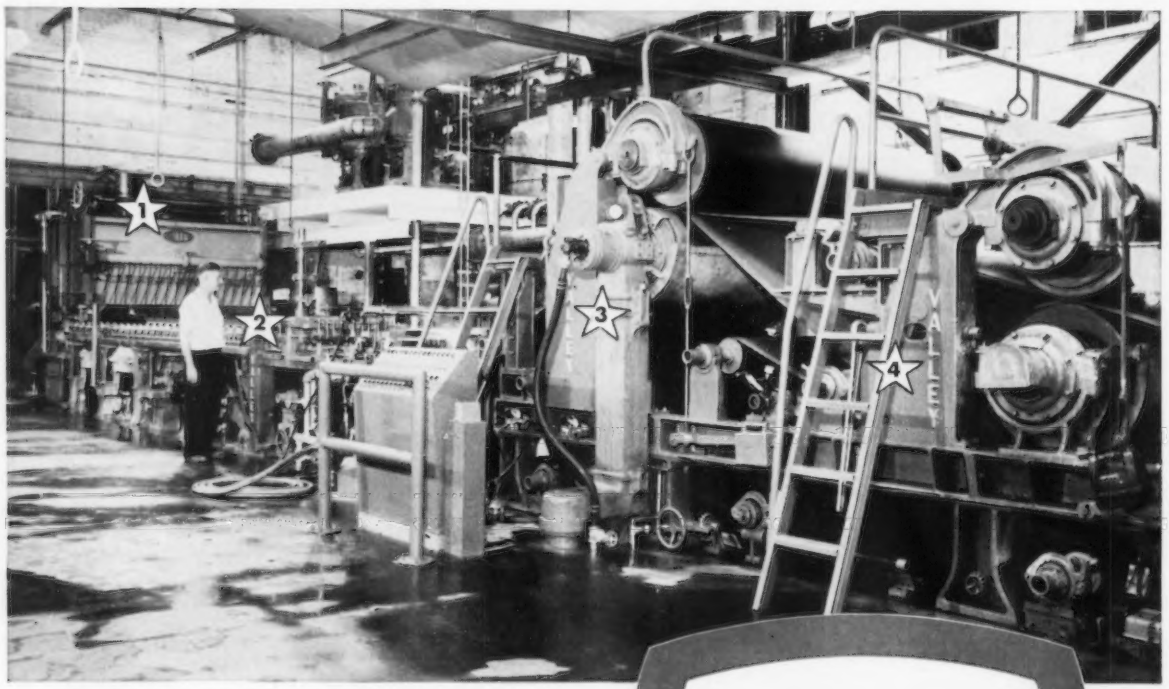
- Compensates for slight stock variations quicker than the best operators.
- Prevents over or under refining, corrects for hard or soft cooks.
- Has improved sheet formation within minutes after first start-up.
- Controls are simple, easy to maintain.

Write, wire or call for details.

Photos courtesy of Otsego Falls Paper Mills, Inc., Division of Menasha Wooden Ware Corporation, Otsego, Michigan

Nekoosa No. 3 REBUILD



by **VALLEY**

1. **NEW** Inlet and Head Box
2. **NEW** Fourdrinier
3. **NEW** Suction Press Arrangement
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Following the complete rebuild of the wet end of No. 3 machine at the Nekoosa mill of Nekoosa-Edwards Paper Company, company officials report extremely satisfactory performance and that the machine is producing a sheet with good characteristics.

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REMEMBER THESE DATES

March 27-28: Annual Conference, Pulp and Paper Subcommittee, American Institute of Electrical Engineers, North Carolina State College, Raleigh, N. C.

May 14-16: TAPPI Coating Conference, Bedford Springs Hotel, Bedford Springs, Pa.

June 2-4: Technical Section, CPPA, Summer Meeting, Chateau Frontenac, Quebec City.

June 3-5: Superintendents' Assn. Annual Meeting Statler Hotel, Boston, Mass.

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PAPER TRADE JOURNAL

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March 10, 1958, *Vol. 142, No. 10*

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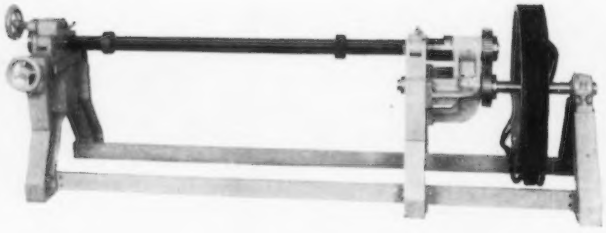
4 OUT OF EVERY 5 REWINDERS WE SELL

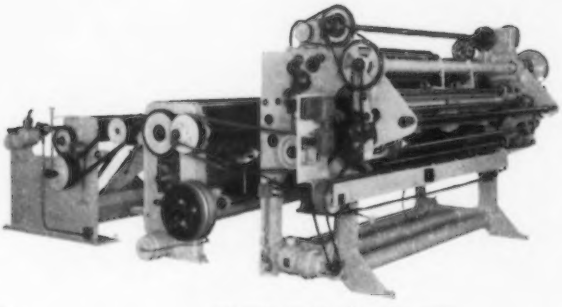
double shaft rewinder for wrapping paper



center rewinder

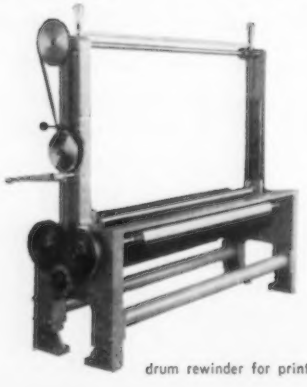
GO TO CUSTOMERS ALREADY USING OUR

general purpose drum rewinder

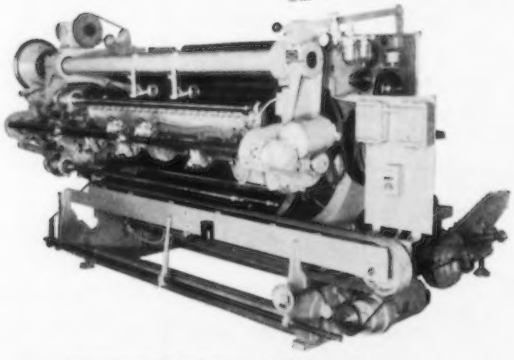


automatic rewinder for toilet tissue

MACHINES TO BOOST PRODUCTION!



drum rewinder for printing press



automatic rewinder for wax and locker wrap

printing presses, rewinders, embossers, folders,
napkin and core machines and special converting machines

PAPER CONVERTING MACHINE COMPANY

GREEN BAY, WISCONSIN

P C M C

NEWS PRINT ROLLS

Yale moves 'em fast!

Yale stacks 'em high!

Look at these mighty rolls of newsprint! Takes dependable performers like these Yale Trucks to stack them three and four to a column. But this is just part of a day's work for the Chicago SUN-TIMES' busy fleet of Yale Electric Trucks augmented by Yale *Worksavers*.

Yale Electric Trucks bring 'em in—stack 'em high—bring 'em down—rush 'em to press! And when the printed editions are ready, it's Yale again—*Worksavers* speeding 'em to the delivery fleet. In again—out again! Up again—down again! As long as there's a deadline to be met—news to be told—these Yale Electric Trucks and *Worksavers* will help speed the making of a great daily.

What do these Yale Electric Trucks have that enable them to do heavyweight lifting with the speed and agility of featherweights? They have Yale's exclusive Magnetic Cam-O-Tactor for extra quick, extra smooth starting. They have a specially designed Yale clamp for handling roll newsprint safely. They perform quietly, smoothly, without vibration, with fume-free cleanliness. And what *economy!* Magnetic Cam-O-Tactor minimizes wear and tear for extra long service. Maintenance is easy, inexpensive. Short design permits narrow aisle operation—more usable space.

For full information about all Yale Industrial Lift Trucks, write The Yale & Towne Mfg. Co., Philadelphia 15, Pa., Dept. A-933.

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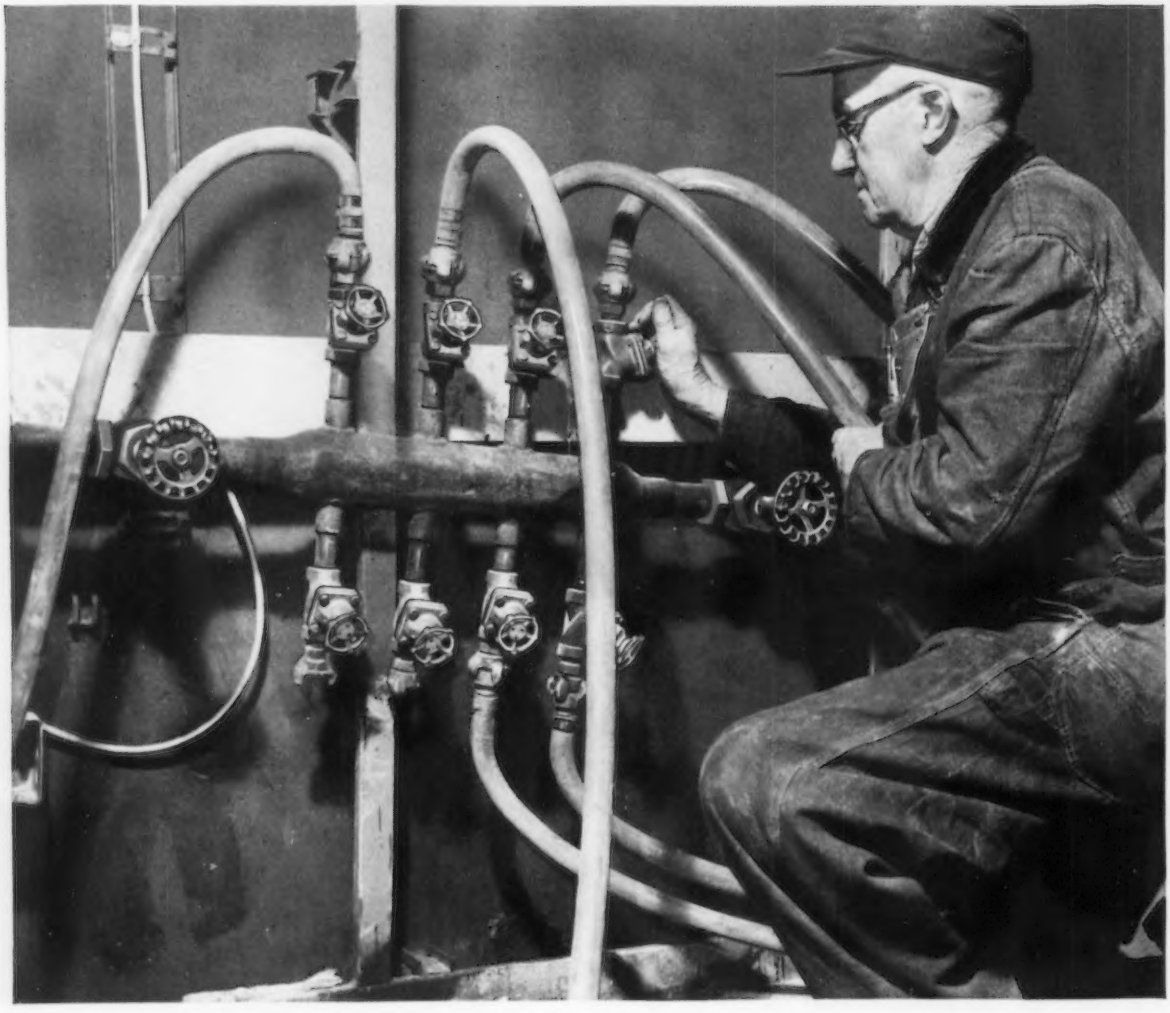
Crane helps another valve user stop high replacement costs



How they solved valve failure on air service

This case history from Willamette Iron & Steel Co., Portland, Ore., shows how you can cut compressed air handling costs in your own plant.

These Crane packless diaphragm valves are handling 100 psi. air on manifolds to distribution lines used aboard ship during construction. Before installing the Crane ¾-inch No. 1610 valves, the yard was troubled by constantly rising maintenance costs. With the other make valves, diaphragms were rupturing after a short time, requiring continual replacement. Loss of air and air power for equipment was costly.

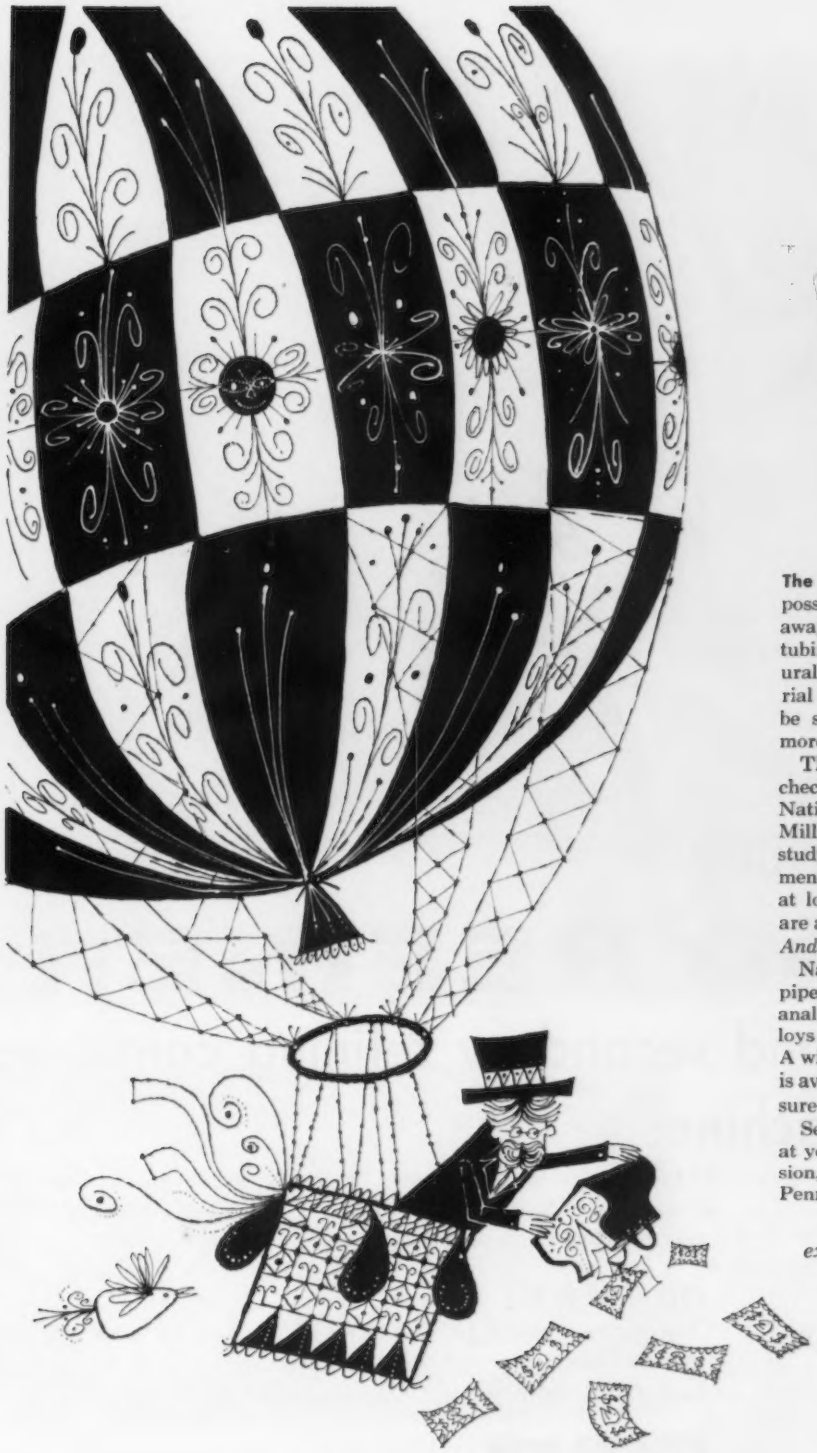
Crane packless diaphragm valves were installed because their neoprene diaphragm functions only as a bonnet seal, and is not subjected to crushing and wear when used as a seating member. The maintenance problem was effectively solved, as it is for so many users throughout industry, by installing the right Crane valve. Contact your Crane Representative today—ask him for complete information on any application.

ASK FOR Crane Folder AD-1942 on packless diaphragm valves. Contact your Crane Representative for a copy, or write to Crane Co., at address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas



Who likes to throw away money?

The answer's pretty obvious. Yet there's a possibility that *you* could be throwing away money when you select pipe and tubing for paper mill applications. Naturally, you want to specify the best material for the job. But, in so doing, you might be spending money unnecessarily for a more costly tubing than you need.

The best way to avoid this is to double-check your choice of materials with National Tube. Our technically trained Mill Service Force will make a careful study of your requirements, then recommend the tubing that will do the best job at lowest cost to you. These technicians are available for consultations in the field. *And,* their help won't cost you a cent.

National Tube manufactures seamless pipe and tubes in a complete range of steel analyses from low carbon through the alloys up to and including stainless steels. A wide range of sizes and wall thicknesses is available for every mechanical and pressure purpose.

Service is our business. Let us serve *you* at your convenience. National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

"The world's largest and most experienced manufacturer of tubular products—National Tube"

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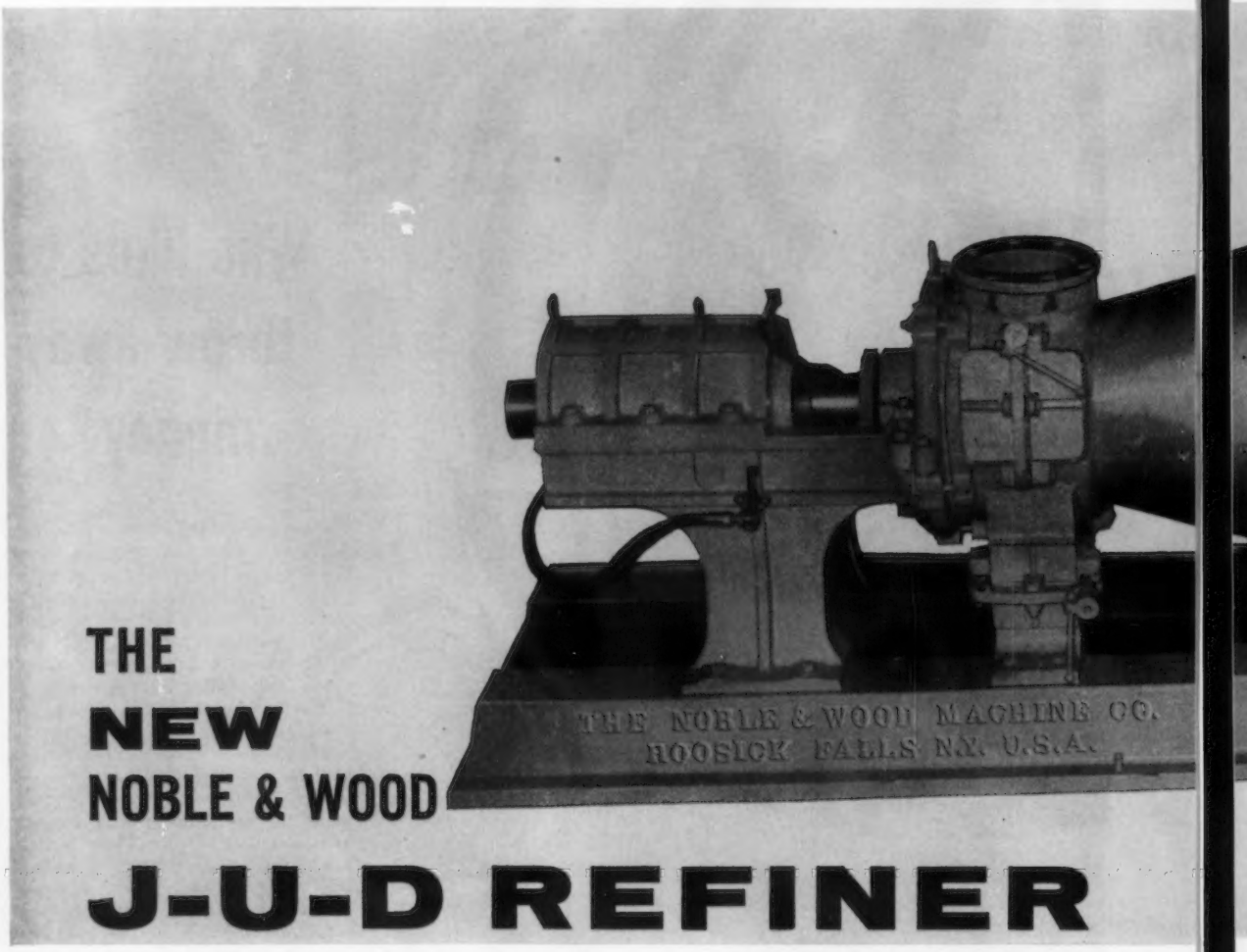


THE NEW NOBLE & WOOD J-U-D REFINER

primary and secondary refining combined in one machine:

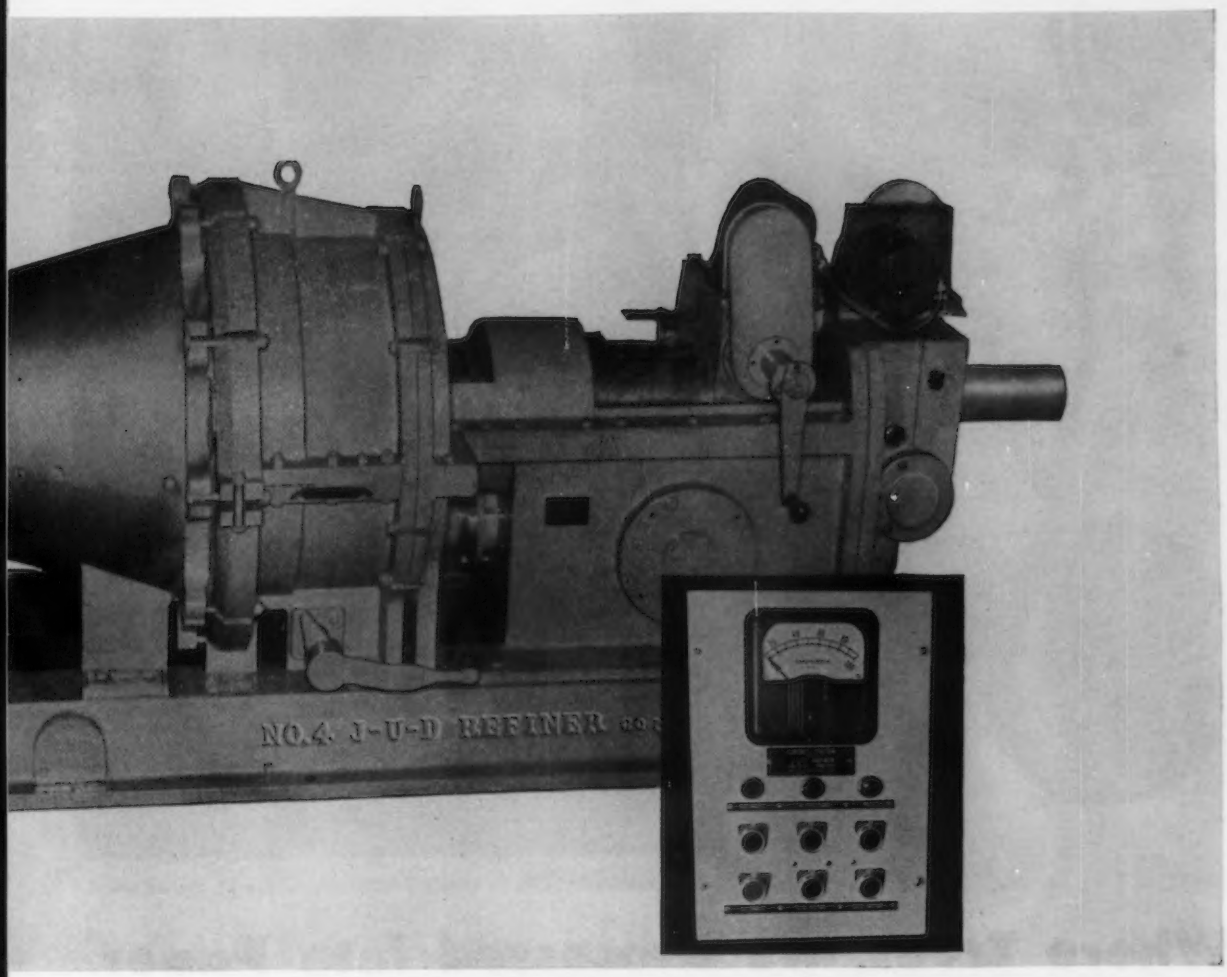
This remarkable engineering achievement is miles ahead of anything else in the industry. It combines the functions of jordan AND disc refiner in *one machine that does the work of either or both.*

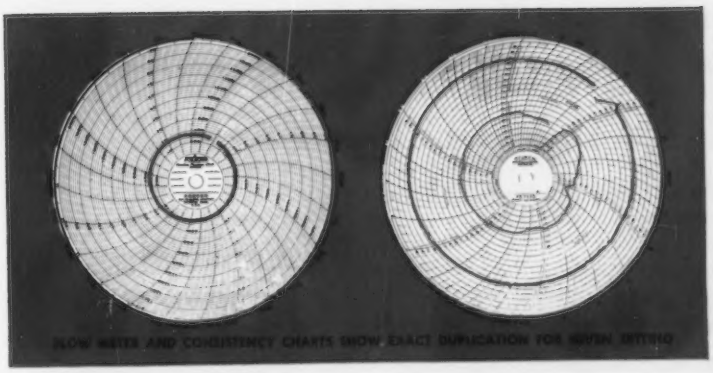
CUTS HP UP TO HALF

The Noble & Wood J-U-D Refiner can be used for most types and grades of paper. It provides *complete* refining of stock on a continuous basis. And it saves up to *half the usual horsepower.*

PERFORMANCE PROVEN

The Noble & Wood J-U-D Refiner has been proven in performance in leading U. S. mills.* Without exception, these mills report that this new machine is far superior to anything they have ever had. Every day that a J-U-D Refiner runs, it sets new records by combining all three basic profit factors: *increased production, higher quality, lower costs.*





- Two individually operating units on one drive
- Available with fully automatic or manual push button controls
- Available in a full range of sizes
- Adaptable to hot stock refining – (with no wood filling used)
- Simplified design for parts replacement and adjustment

* Let us show you how the J-U-D Refiner can improve *your* production cost figures. Write or phone today for actual production records, technical data, sizes and specifications.

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PAPER MILL MACHINERY

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Crossett Paper Mills, A Division of The Crossett Company, Crossett, Arkansas

Where Trees are Processed into Paper

Wyatt's Fabricated Metal Products Multiply as the Mills Expand in the Forests Whose Growth Exceeds Consumption.

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MANUFACTURERS AND ERECTORS SINCE 1913

Cities Service Pacemaker Wax wins praise from Advance Finishing Company, Chicago, Ill.

"The Wax is Wonderful, The Service Supreme!"

"Let me make it clear that we're a *service* company for folding box manufacturers and lithographers," says Advance Finishing's Joseph Kessel.

"That means we've got to satisfy people in the folding carton and display business who recognize and demand the best finishing job, including wax coating.

"Cities Service Pacemaker 42 Wax is an important factor in our coating formula for two reasons: First, the wax itself provides the slippage, hardness and gloss so vital to our operation. Secondly, the service and localized warehouse facilities of Cities Service are in a class by themselves.

"Whenever there's a difficult job to be done, we know we can rely on our Cities Service Wax Specialist to work with us in planning proper waxing procedure. Likewise, we can order our wax from the local warehouse and don't have to store a burdensome amount at our own plant."

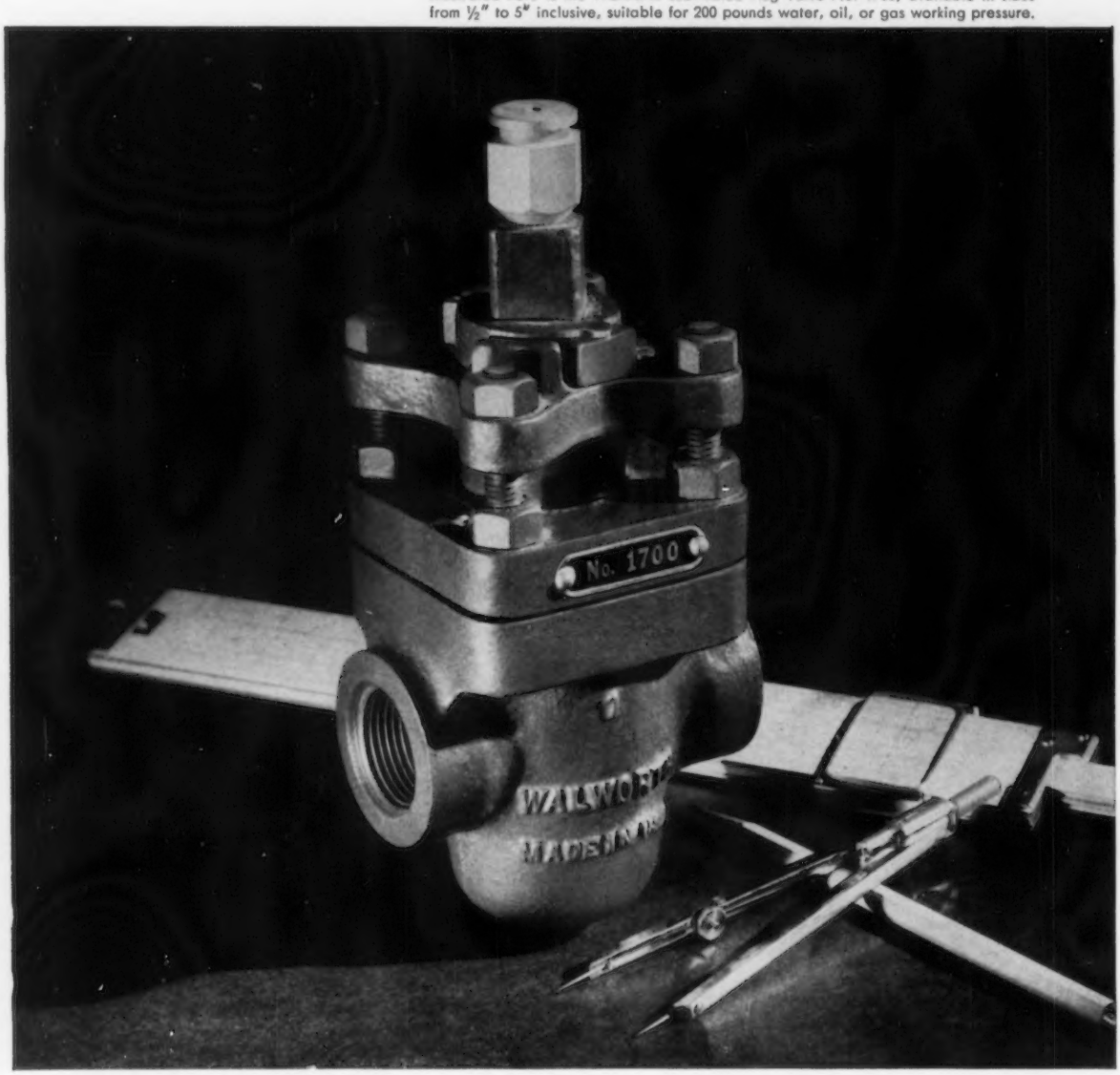
Like Advance Finishing Company, if you're looking for that unique combination of supreme quality plus unexcelled and unfailing service, talk with a Cities Service Wax Representative. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

Paper sack protects the stack! Striving for perfection, Advance Finishing developed this novel idea to prevent tipping and dust accumulation in printed cartons. Perfection also dictated choice of Cities Service Pacemaker Wax.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Illustrated here is the Walworth Lubricated Plug Valve No. 1700, available in sizes from ½" to 5" inclusive, suitable for 200 pounds water, oil, or gas working pressure.



problem-solvers for tough jobs

*LPV's by WALWORTH

If you're familiar with the basic advantages of Plug Valves, you know why Walworth Lubricated Plug Valves work so well in really tough spots. You know about their direct port opening . . . their dead tight shut off. Seating and sealing surfaces are fully protected from attack by fluids being handled by insoluble lubricants.

Remember, you can get Walworth LPV's in all sizes . . . from ½ to 30 inches . . . for pressures up to 5000 psi and for vacuum service . . . in a number of different styles and patterns. For more information about LPV's and for your copy of the new Walworth LPV Circular, see your local Walworth Distributor.

*Lubricated Plug Valves

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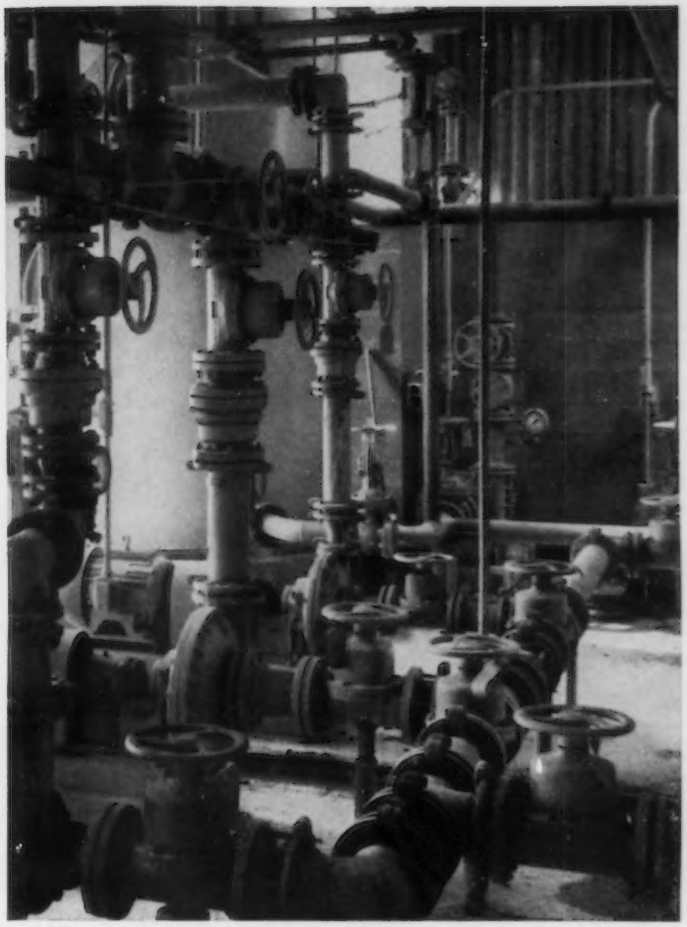
Maintaining maximum flow in serum lines with minimum pressure drop



Goodyear Tire & Rubber Company reports no valve clogging or interruption to flow in handling viscous fluids — with Grinnell-Saunders Straightway Diaphragm Valves.

Grinnell-Saunders Straightway Valves are now in use on serum lines of the Goodyear Tire & Rubber Company. Serum is a suspension of rubber particles in an acid brine solution. The installation pictured above is in Goodyear's Synthetic Rubber plant at Houston, Texas.

Grinnell-Saunders Straightway Valves were selected for this service because of their straight-through design. Material in process cannot build up and choke off flow because there are no pockets or gate trenches to trap solids. The straight-through feature also assures speed, ease and economy of rodding out, when necessary. When a diaphragm must be replaced — that job, too, can be done quickly, without removing the valve body from the line.

Isolation of operating parts from the fluid stream is still another important advantage of the Grinnell valve . . . eliminating corrosion and clogging of the valve mechanism while, at the same time, preventing contamination of product in the line.

Grinnell-Saunders Diaphragm Valves are available in a wide range of body, lining, and diaphragm materials to meet different service conditions. To secure further information, contact the Grinnell branch office nearest you — or write directly to Grinnell Company, Inc., 277 West Exchange Street, Providence, R. I.

Open

Diaphragm lifts high for streamlined flow in either direction. No irregular surface to trap deposits.

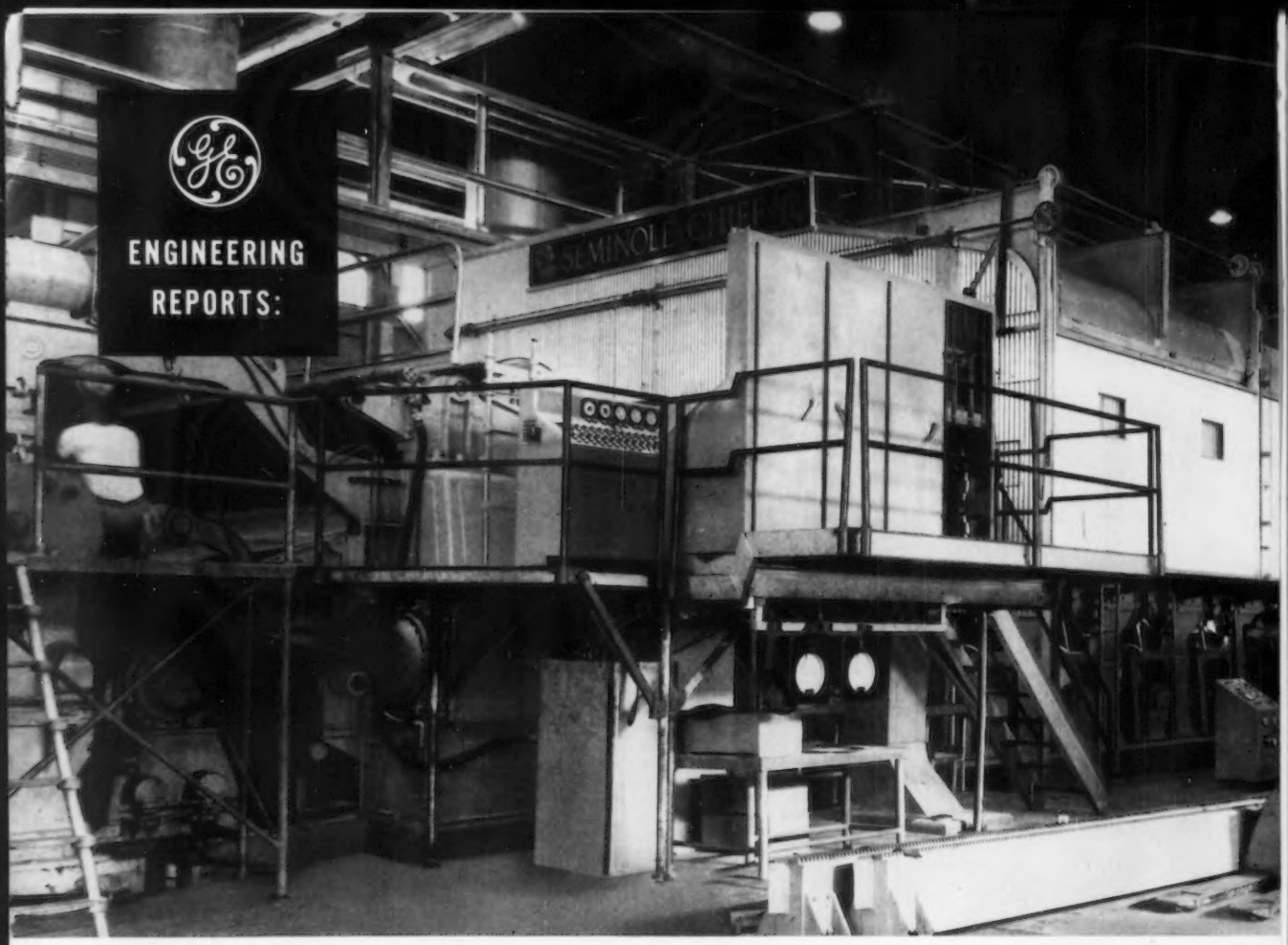
Closed

Diaphragm presses tight for positive closure, even when handling viscous or fibrous materials.

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems



GENERAL ELECTRIC HELPER DRIVE SYSTEM POWERS . . .

World's biggest kraft board

New "Seminole Chief" adds 1000 ton-per-day capacity to St. Regis' Jacksonville, Fla., mill

PLANNING ELECTRICAL EQUIPMENT requirements for mill are (L-R): G. E. Shaad and J. B. Peebles, Jr., both of General Electric Co.; and L. C. Crowder, Chief Engr., O. A. Smith, Staff Engr., and J. A. McDermott, Gen. Mgr. of Pulp and Paper Production, all of St. Regis Paper Co.

The huge new paper machine with a rated capacity of 1000 tons per day is now operating at the St. Regis Paper Company's Jacksonville, Florida mill. Part of an expansion begun two years ago, the newest and largest kraft board machine in the world manufactures paperboard used primarily to make corrugated containers. Known as the "Seminole Chief," the new Fourdrinier machine built by Beloit Iron Works is designed for speeds up to 2500 feet per minute.

Electrical Equipment furnished by General Electric for the mill expansion includes the electrical helper drive and the world's largest regenerative tension winder drive for the machine rewinder. Featuring static regulators self-contained in the control line-up, the helper drive supplies a total of 990 horsepower distributed over 12 motors applied to wet and dry end sections. Accurate control of machine operation is achieved by regulation of current, voltage or speed, based on individual section requirements. The factory-wired static regulators allow a savings in installation time and space, as well as a reduction in rotating equipment maintenance.

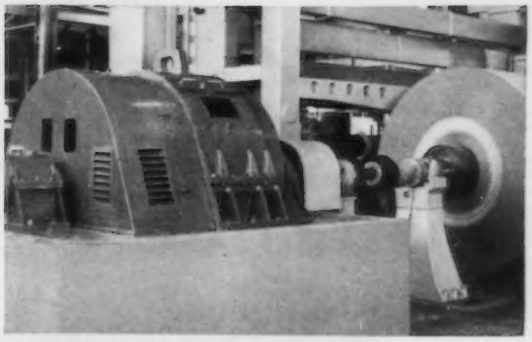
machine

The Winder Drive can accelerate or decelerate in approximately ½ minute, can stop in emergencies in 15 seconds. A 500-hp direct-coupled braking generator operates over a mill roll build-down range of 4:1, controls sheet tension to a preset value from 2½ to 11½ pounds per inch of width. Two 400-hp motors power windup stand at speeds up to 6500 feet per minute. Operator's console permits complete control of rewinding operation, requires minimum of operator attention.

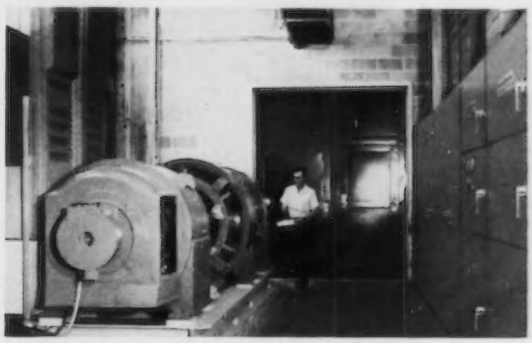
Co-ordination of equipment into a flexible, easy-to-maintain electrical system—designed to meet the special needs of this mill—was the result of close cooperation between St. Regis and General Electric engineers. Whatever your drive requirements, G-E engineering services are ready to help design, equip, and install a co-ordinated electrical system from one-line diagram to on-time startup. Simply contact your nearest General Electric Apparatus Sales Office for more information on paper mill drive systems. Or write for bulletin GEA-6508, Drive Systems for Pulp and Paper Mills, General Electric Company, Section 655-21, Schenectady 5, New York.

Engineered Electrical Systems for the Paper Industry

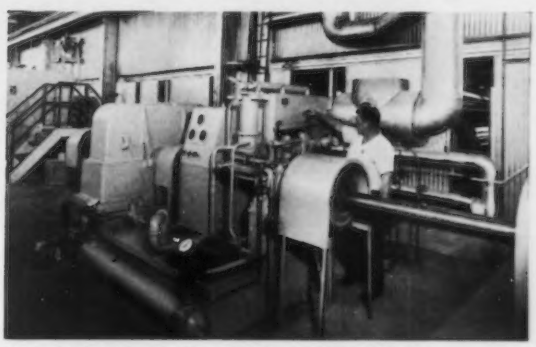
GENERAL ELECTRIC



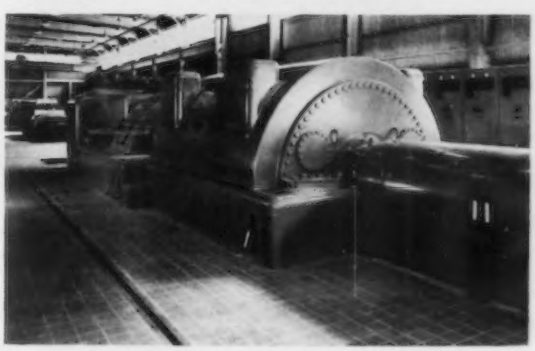
WORLD'S LARGEST regenerative tension winder drive has 500-hp direct-coupled braking generator, two 400-hp windup motors to power winder up to 6500 feet per minute.



MAIN M-G SET for winder drive is rated 400 KW. Installation was simplified by use of high capacity busway to interconnect elements of winder drive.



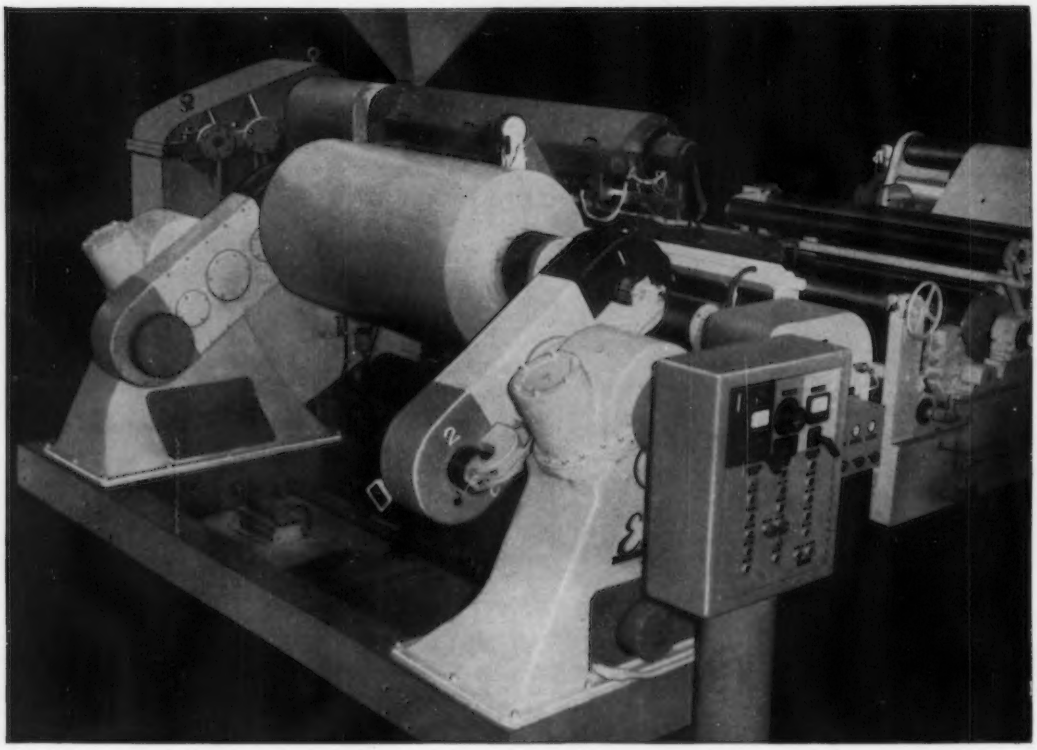
MECHANICAL-DRIVE TURBINE, rated 3600 hp, provides speed regulation of .1% for mechanical line shaft drive.



30,000 KW TURBINE-GENERATOR increases mill's total generating capacity to 53,000 KVA, is tied to present distribution system permitting shift in steam or load between existing and new equipment.

it's Egan 3 to 1

BETTER THAN 75% OF ALL COMPANIES OPERATING POLYETHYLENE EXTRUDER-LAMINATORS USE EGAN EQUIPMENT



This high-speed production unit, with patented features, includes a Flying Splice Turret Unroll, Flying Transfer Turret Winder, Laminator, and 6" Extruder. It was Egan built for Scott Paper Company

Egan's Flying Splice Turret Unroll and Flying Transfer Turret Winder was designed to splice and make roll changes at machine speeds up to 1000 fpm. The unit will apply thin coats of polyethylene to wax paper up to 72" wide.

Discover for yourself why more than three-quarters of all companies in the field rely on Egan.

Write, or phone Randolph 2-0200, for complete information about this and other Egan equipment . . . with many patented features.

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Manufacturers of machinery for the paper converting industry

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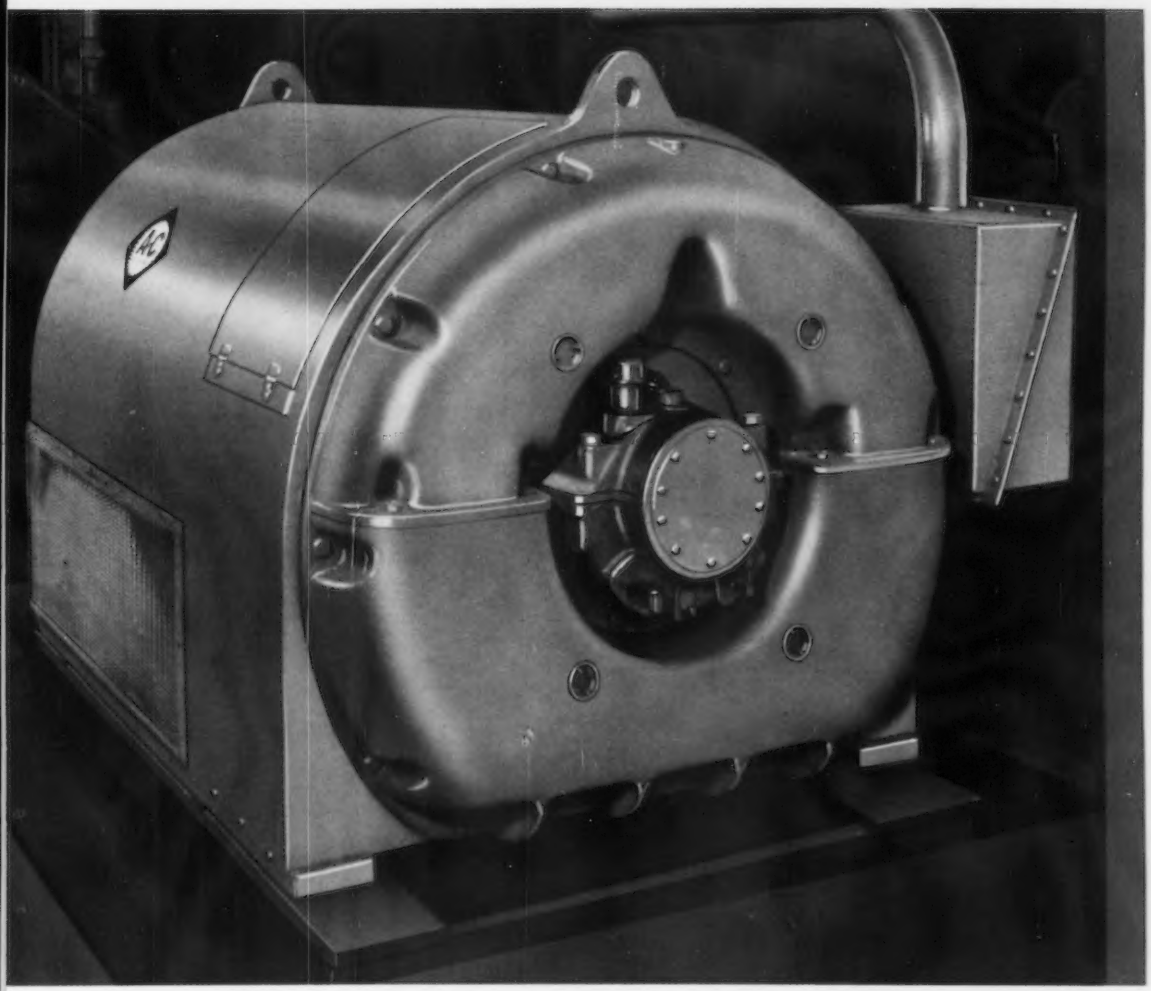
Revolutionary Advance in Motor Protection

made possible by SILCO-FLEX insulation

plus 10 integrated mechanical features

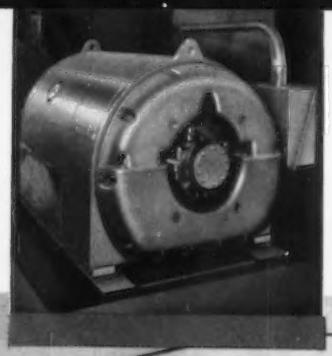


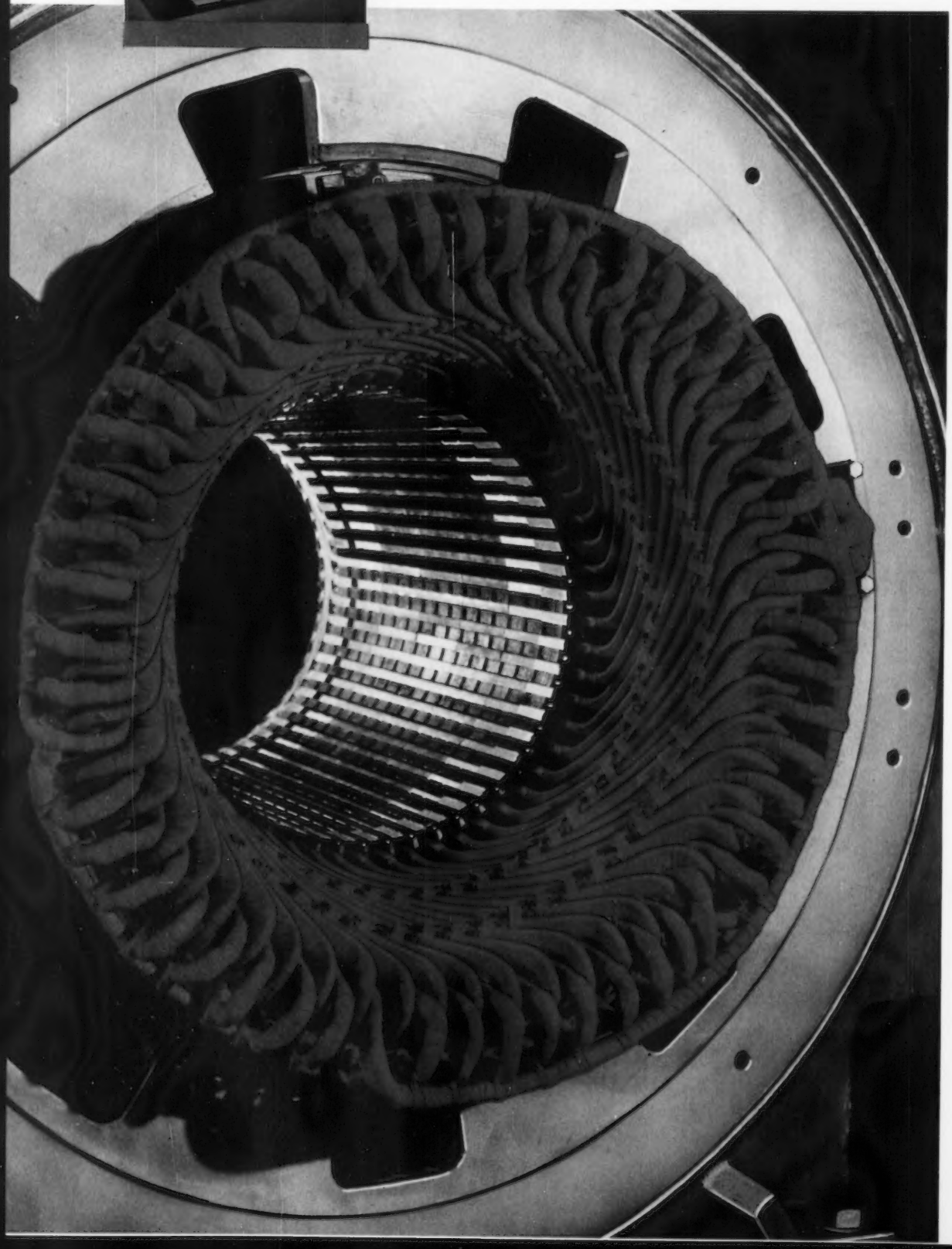
- **Designed to meet needs of chemical, paper, petroleum, metals, power and rock products industries where moisture, dirt, abrasive dusts or corrosive atmospheres are a problem.**

ALLIS-CHALMERS

A-5636

New Motor is





super-sealed

It's drip-proof — yet withstands moisture • abrasive dust • chemicals • high humidity • heat

The *Silco-Flex* system of insulation is used on all stators. Field coils of synchronous motors are bonded in heat-stabilized resins, enclosed in a resin-impregnated sheath of oriented glass fibers and bond-locked on the pole structure.

The superior electrical protection of Super-Sealed motors results from the insulating *system* used... not just the insulating material. The same material, conventionally applied, would retain certain weaknesses of conventional insulation.

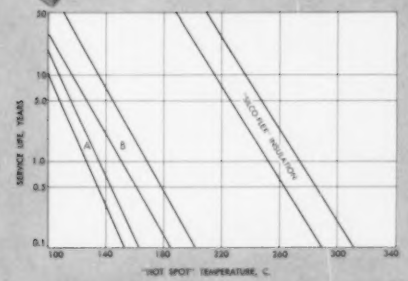
Applied the A-C way, it has these qualities that add reliability and service life:

Dimensionally stable — withstands heating, thermal shock, vibration and fatigue at elevated temperatures.

Sealed throughout — resistant to most chemicals, water, high humidity, weather, aging, corona and lubricants.

Homogeneous — provides a void-free dielectric barrier, homogeneous under extremes of differential expansion and contraction due to thermal cycling.

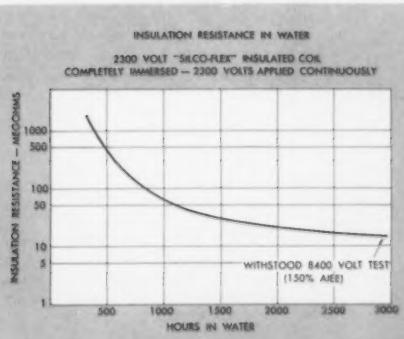
All Super-Sealed motors have revolutionary Silco-Flex insulation



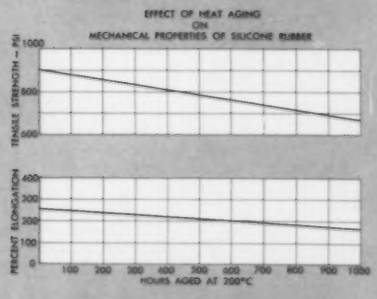
Heat resistant — *Silco-Flex* insulation gives much longer service life under higher temperatures than conventional materials.

Silco-Flex Insulation | *Polyester Mica Tape* | *Asphaltum Mica Tape*

Abrasion resistant — Samples of insulation show effect after sandblasting for one minute with 90-grit aluminum oxide and 100-psi air. Nozzle to sample distance was six inches, thickness equivalent to 2300-volt insulation. Note difference in abrasion.



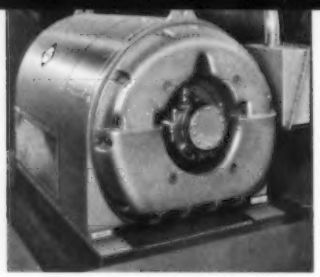
Moisture resistant — Test curve shows that *Silco-Flex* insulation, after 3000 hours of total immersion with 2300 volts impressed on coil, withstood high potential test of 8400 volts without injury.



Flexible, resilient — Rubbery *Silco-Flex* insulation remains flexible and resistant indefinitely. It is especially resistant to mechanical abuse and to stresses of overloading, rapid starting and stopping.

Silco-Flex is an Allis-Chalmers trademark.

ALLIS-CHALMERS



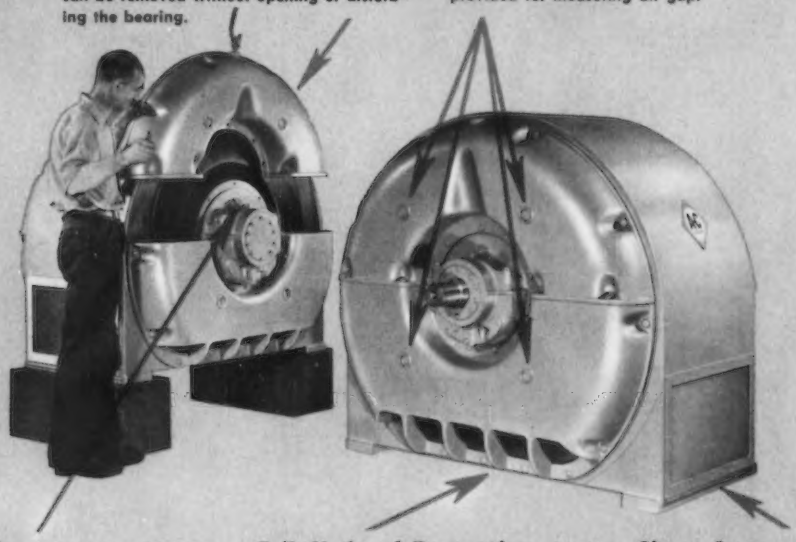
New Super-Sealed motors

10 mechanical features

Super-Sealed motors combine the perfect insulation with features that assure the mechanical as well as the electrical reliability of these motors.

Accessibility — Split-type end shields can be removed without opening or disturbing the bearing.

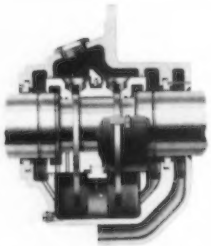
Ease of Inspection — Four points are provided for measuring air gap.



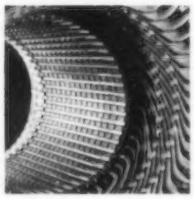
Clean Check — Glass inspection bullseye permits checking operation of oil rings without dirt falling inside bearing.

Full Circle of Protection — Steel plate across bottom of motor protects it from dirt and rodents.

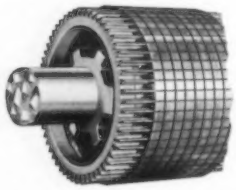
Clean Appearance — Foundation bolts are hidden, machine is clean-looking.



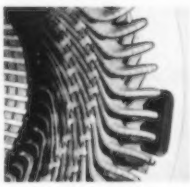
Self-Aligning Capsule-Type Bearings are center seated with single seat. Breather relieves pressure of oil in bearings that could cause leakage.



Precision Construction— Slot sticks are non-hygroscopic-trapezoidal, fabric base phenolic. End turns, spaced with polyester glass mat spacer pieces, are laced and tied with flat lubricated glass tubing for long trouble-free life.



Solid Construction—Silver-brazing rotor rods to end ring assures a good joint.

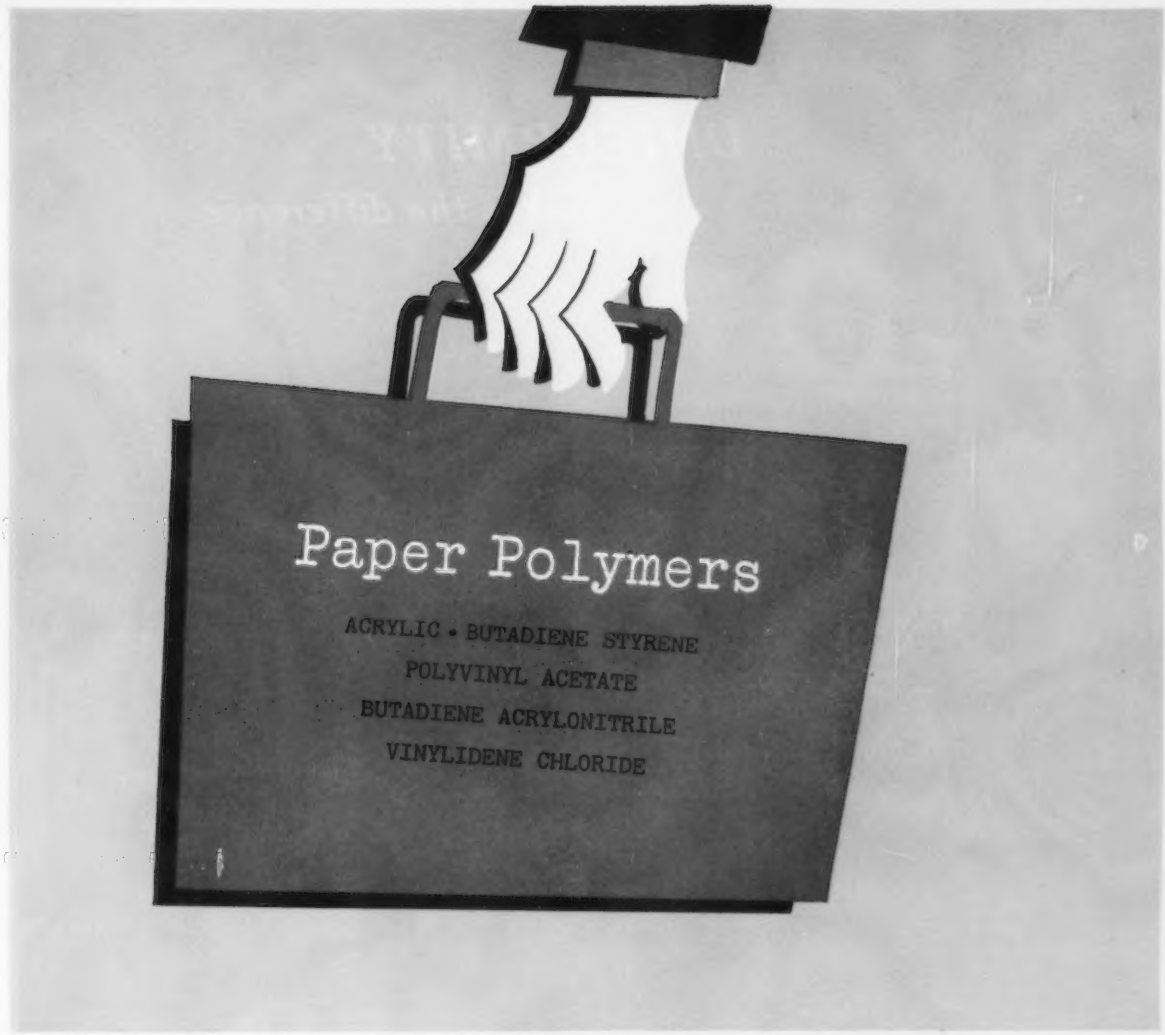


Rigid — End turns of higher speed motors are supported by insulated coil support rings to prevent injurious distortion due to high starting torque and frequent starting.

Timesavers—Separate plates provided to show direction of rotation and magnetic center. Terminal box is amply sized and diagonally split. Leads are brought out through grommet.

For the complete story, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS



Borden is always on hand with expert technical service!

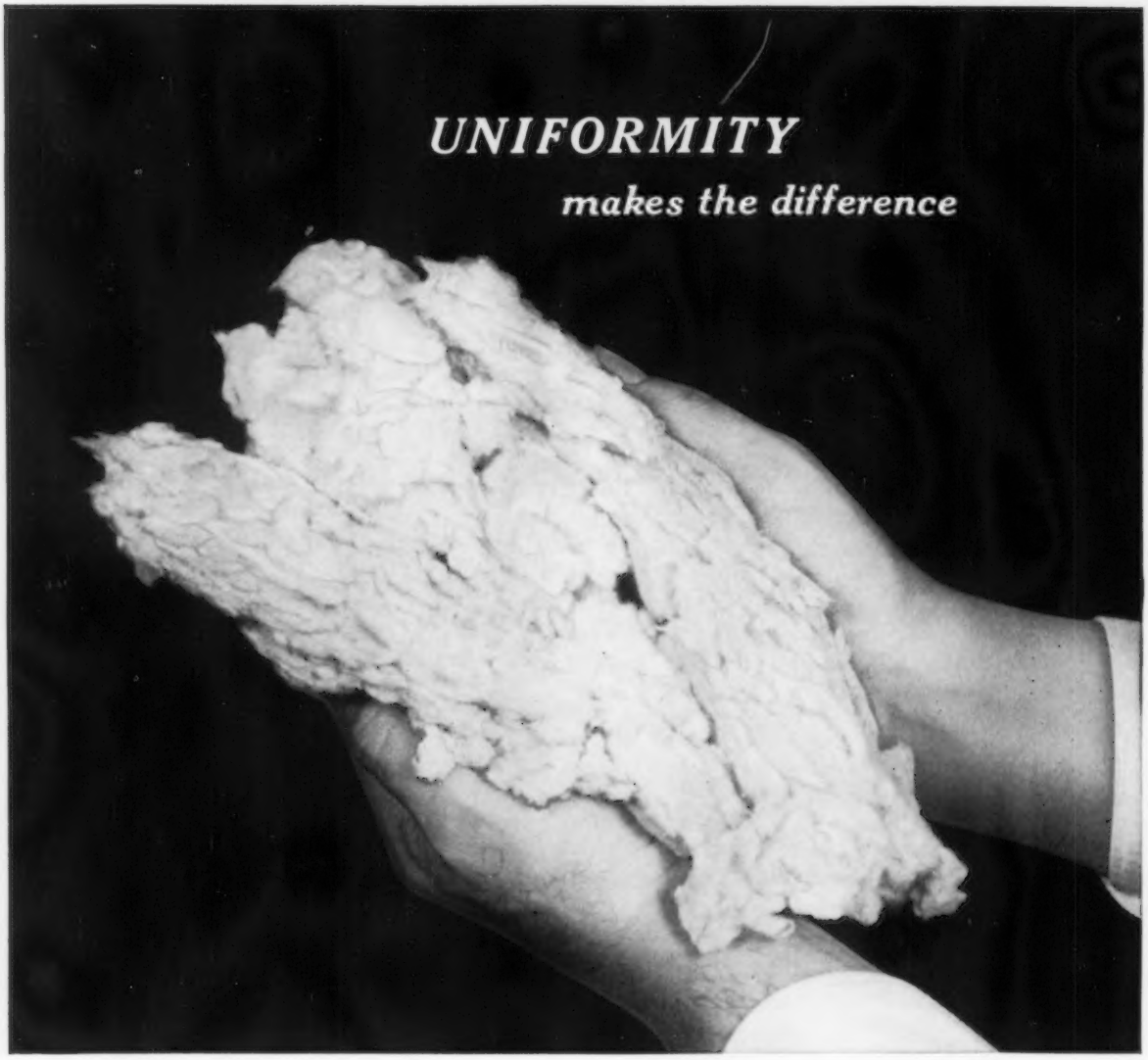
A trained Borden Technical Service Expert is anxious to help you profit with Borden polymers for pigmented and functional paper coatings. He will explain how Borden's *complete* polymer service can result in better products at lower cost for you.

If you're looking for coated papers with superior machinability—printability, grease resistance, abrasion resistance, fold, wet rub resistance, moisture vapor barrier—or if you need good functional base coatings . . . Borden will help you get them with the widest range of polymers in the industry. What's more, Borden paper experts will work with you every step of the way to adapt the right polymer product to your process.

Your Borden Representative is your direct line to the complete facilities of the Borden Research and Development Laboratories, where new products, formulations and application techniques are under constant study. And Borden plants and warehouses are strategically located throughout the country to assure prompt delivery of polymers when and where you need them.

So remember . . . if you're seeking a dependable source of supply for *all* your polymer needs, write today to The Borden Chemical Company, a division of The Borden Company, Polyco-Monomer Dept. PTJ-38, 350 Madison Avenue, New York 17, N. Y. You'll soon agree . . .

IF IT'S A *Borden* *Chemical* IT'S GOT TO BE GOOD!



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To produce bigger profits for you our research engineers stand ready to assist in developing new ways of using cotton linters. Throughout its many years, Railway has consistently pioneered new uses for cotton linters—has maintained its outstanding reputation for highest standards of *uniformity, color, quality and cleanliness.*

At Railway, "PAPER-RATED" means the finest linters for the finest paper. Write for further details today.

Railway SUPPLY AND MANUFACTURING CO.

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Cable Address: RAYCO, All Codes

Straws in Business Wind

Machine tool builders report strong upswing in February orders . . . Steel industry leaders believe their business will get off bottom in mid year . . . Freight car loadings and automobile production were maintained at a low level the last week of February . . . Utility electric power generation was well ahead of February 1957 . . . Steel production continued at a capacity rate in the low 50's . . . Bituminous coal production was 80% of the same period last year.

February Production Rates

During February the paper mills ran at about 87½% of capacity and the board mills at about 86½%. This compares with 97% and 94% respectively for February 1957.

Economics of Pulping Methods

Economics of the various commercial pulping processes are interestingly examined and discussed in an article by R. A. Diehm, beginning on page 50.

Set-Up Boxes in January

Dollar value of sales in set-up box manufacturing was off 1.4% in January 1958, compared with the first month of last year according to a report by the National Paper Box Manufacturers Assn. Indications are that new orders received were down much more than sales for the same period.

Calls for Process Re-examination

Excessively high capital costs for new pulp and paper mills and expansions call for re-examination and appraisal of our present methods and processes, states the author of one of our feature articles in this issue. The author touches on highlights in various stages of our operations and points out areas for research which may result in reduced capital costs.

No Change in Waste Paper

Waste paper markets in the major areas across the country show no important change from preceding months, either in volume or prices.

One Hundred Fifty Years Young

In this issue we salute Knowlton Brothers who are celebrating their 150th anniversary this year. A young and vigorous organization.

Light, tough PVC (POLYVINYL CHLORIDE) withstands 281 corrosive chemicals

Got a stubborn corrosion problem?
It could pay you well to look into Ryertex-Omicron PVC. This remarkably versatile plastic has a 20-year history of successfully resisting corrosion—acids and alkalies, gases and liquids.

With only 1/6 the weight of steel, PVC is available as pipe valves, fittings, sheets and bars. It is nontoxic, odor-free, flame-resistant and non-magnetic. It works readily, is easily assembled and installed.

Time-tested applications include: pulp lines, chlorine lines, chlorine gas distributors, white-water tanks, sizing tanks, head boxes, troughs, blowers, flow boxes and baffles, beater linings, fan housings, bars and girths, trays, and pulp measuring devices.

Large stocks of PVC are available for immediate shipment at your nearby Ryerson plant. Send for our free booklet giving you the pertinent facts about this versatile, cost-cutting material. Or call Ryerson today.

Joseph T. Ryerson & Son, Inc.
Box 8000-A, Chicago 80, Illinois

Please send me your PVC Bulletin 80-3.

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RYERSON STEEL

INDUSTRIAL PLASTICS AND BEARINGS DIVISION

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK · BOSTON
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CHICAGO · MILWAUKEE · ST. LOUIS · LOS ANGELES · SAN FRANCISCO
SPOKANE · SEATTLE

Contract Let for Wallula Construction

Boise Cascade Corp. has entered final negotiations with Swinerton and Walberg Co. of San Francisco on a contract to cover construction of the new BCC pulp and paper mill.

W. O. Hisey, director of central engineering, said Swinerton and Walberg were chosen following several months of thorough investigation and consideration of a number of construction firms with extensive experiences in the building of pulp and paper mills.

The pulp and paper mill to be located at Wallula, Wash., will be operated as a wholly-owned subsidiary of Boise Cascade Corp. under the name of Cascade Kraft and it is anticipated that construction will be completed and operation begun early in 1959. Work to be covered by the proposed contract includes the construction of the foundation and buildings for the pulp and paper mill, as well as installation of pulp and paper mill machinery and complete piping for the entire project.

Trial Under Way on Cabbage Palm Scheme

Trial is under way at Miami, Fla., of four men who are alleged to have defrauded investors of $175,000 in a scheme to make paper from cabbage palms. The case is being heard in Federal Court and will not be concluded until mid-March.

The defendents are: Harry Getchell, who was president of the defunct Florida Alpha Pulp Co.; his son, Harry; William Powers, who was one-time executive secretary of the Florida Board of Control, and Hollis Rinehart, Miami attorney and long-time member of the Florida Board of Control.

They are being tried on a 12-count indictment charging violation of postal laws and Federal Securities Commission rules in "a scheme to defraud."

One of the first witnesses, J. William Gall of Daytona Beach, testified he became so enthusiastic over the plan to convert cabbage palms into pulp and cellulose products that he and two uncles dropped $38,000 in the deal. He said he also brought Daytona Beach friends into the promotion for additional thousands of dollars.

The Florida Alpha Pulp Co. ended in receivership. Mr. Getchell's quarter interest in the company, it was brought out, was sold for $1.

Hammermill to Borrow $25 Million

Hammermill Paper Co. announced it has completed an arrangement to borrow $25 million of long term funds from the Prudential Insurance Co. over the next three years.

The money is to be used to complete the company's present program of major improvements and expansion of the pulping and finishing facilities at the Erie, Pa., plant.

Funds also will be provided for continuation of acquiring paper making facilities now under study but for which no commitments had been made previously.

Blandin Profits to Go to Foundation

The last will of Charles K. Blandin, who died last month, establishes a Charles K. Blandin Foundation to which profits of the Blandin Paper Co. will be paid to be utilized for charitable, educational and civic purposes.

After leaving annuities and payments to relatives and for care of cemetery lots, Mr. Blandin's will gave $25 to each employee of the company with one year or more service, and $15 to those with six months but less than one year's service.

All the remainder of his estate, which includes all the capital stock of the Blandin Paper Co., as well as substantial outside investments, is left to Northwestern National Bank of Minneapolis (that company being represented by Samuel H. Rogers, vice president and vice chairman of the trust committee) and William H. Oppenheimer, and their successors in office as trustees.

Income from the outside investments will be paid to the Charles K. Blandin Foundation, and profit from the Blandin Paper Co. over and above the needs of the business will also be paid to the Foundation.

Mead Closes Nashville Mill

Mead Corp. closed down operations at the Nashville, Tenn., paperboard mill at 7 a. m. on March 7.

D. F. Morris, president, said closing of the mill, which began operations in 1933, is due to economic conditions in the paperboard industry. The mill employed 113 persons.

Employees will receive a separation allowance based on earnings and length of service and many will be eligible for vacation pay.

Workmen Injured by Chlorine Gas

Some 80 workmen are recovering from the effects of chlorine gas that escaped from a pipe in a paper mill when the pipe was shattered by a huge chunk of ice which fell from the eaves of a building at International Paper Co. in Corinth, N. Y.

The accident occured as shifts were changing. Most of the men affected were employees of a construction company which is putting up a new building at the plant.

The pipe was carrying liquid chlorine under pressure to an evaporator tank outside a bleaching building.

Paper and Board Production

According to the American Paper and Pulp Assn., the ratio of the United States production to mill capacity for the week ending February 22, 1958, was 87.2 per cent compared with 88.4 per cent revised for the preceding week. The ratio was 97.7 per cent for the corresponding week a year ago.

The paperboard production ratio for the week ending February 22, 1958, was 89 per cent compared with 86 per cent for the preceding week and 93 per cent for the corresponding week last year.

(Detailed statistics on page 58.)

Six Companies Form Research Center

Six companies, five of whom have their headquarters in upper New York State, have established Fiber Products Research Center for the purpose of conducting research projects for all six, according to an announcement by J. P. Lewis, president of the new organization.

The six sponsoring companies are: Brownville Board Co.; J. P. Lewis Co.; Latex Fiber Industries Inc.; Milwaukee Lace Paper Co.; Payne-Jones Inc.; Smith Lee Co. Inc.

The undertaking may be a singular effort for the paper industry because the companies do not manufacture allied product lines. All but one have their own manufacturing and distribution facilities. Two are specialty paperboard manufacturers, one manufactures specialty papers based upon use of rubber latices, one is a coater producing simulated leather materials and the remaining two are paper converters. The common thread running through the six is that all are interested in the manufacture and conversion of paper.

"Operations are scheduled to begin at the end of 1958. The building is in the initial stages of preparation for the equipment and personnel which are being obtained to make it a modern, fully equipped and staffed research organization. Plans provide for a fiber and pulp research group, a synthetic rubber, plastics and coating research group, an analytical chemistry group, a pilot scale manufacturing and conversion group and a new products marketing group. The new products marketing group is considered an unusual appendage to a research organization. Its assignment will be to determine the market possibilities of new products flowing from the Center before assignment to one of the companies, thus shortening the length of time needed to exploit a product after it has been created," Mr. Lewis explained.

TAPPI Functional Conferences

The Technical Association of the Pulp and Paper Industry has announced the following functional conferences to be held during 1958.

12th Alkaline Pulping Conference—September 24-26—Arlington Hotel, Hot Springs, Ark.

9th Coating Conference—May 14-16—Bedford Springs Hotel, Bedford, Pa.

8th Corrugated Containers Conference—November 5-6—Netherland-Hilton Hotel, Cincinnati, Ohio.

3rd Deinking Conference—October 9-10—Dayton-Biltmore Hotel, Dayton, Ohio.

13th Engineering Conference—July 28-August 1—Multnomah Hotel, Portland, Ore.

Fundamental Research Conference—September 15-17 — Queen Elizabeth Hotel, Montreal, P.Q.

3rd Mechanical Pulping Conference—September 10-12—Chateau Frontenac Hotel, Quebec City, P.Q.

13th Plastics-Paper Conference—October 20-22—Sheraton-Kimball Hotel, Springfield, Mass.

9th Testing Conference—September 29-October 1 — General Ogelthorpe Hotel, Savannah, Ga.

7th Statistics Course—July 7-18—Laval University, Quebec City, P.Q.

Advertising Award Goes to Downingtown

Encased George Washington Honor Medal was presented to Downingtown Paper Co. for its "Better Community" advertising series by the Freedoms Foundation at Valley Forge. The top award in the local advertising category was accepted by F. Huston McIlvain (center), president of Downingtown Paper Co. Presentation was made by Dr. Kenneth D. Wells (left), president of Freedoms Foundation, and Dr. M. E. Sadler, president of Texas Christian University and chairman of the 1957 National and School Awards Jury.

PAPER PEOPLE

Charles F. Chaplin

John D. Zink

Resigns as President of Allied Paper

Charles F. Chaplin has tendered his resignation as president of the Allied Paper Corp., Chicago.

Inasmuch as he has been endorsed as the Republican candidate for president of the Cook County Board, he explained that he will not be able to continue his full responsibilities as president.

Arnold H. Maremont, chairman of the board, expressed regret in accepting the resignation. A successor to the office of president will be named later.

Mr. Chaplin, at the invitation of the chairman and the board, will continue his long association with Allied as vice president and director of the corporation. In this capacity, it was understood that he will give his attention to special sales and marketing problems.

Personnel Dept. Changes at Chillicothe Div.

Two changes in the personnel department of the Chillicothe Division of Mead Corp. have been announced. John W. Cleveland is the new assistant personnel manager, and Vernon C. Lange suceeds Mr. Cleveland as employment manager.

Great Northern Appointment

Great Northern Paper Co. appointed John H. Staples an assistant to the president. His duties will be to act as the liaison between the executive department of the company and its customers.

John H. DeVitt

Appointed to Top Hammermill Posts

The appointments of John D. Zink as senior vice president and of John H. DeVitt as assistant general manager of Hammermill Paper Co., Erie, Pa., have been announced.

In addition to the senior vice presidency, Mr. Zink will continue as director of merchandising and as a Hammermill director and member of the executive committee.

Mr. DeVitt likewise will continue as treasurer of the Erie, Pa., pulp and paper company and as a member of the board of directors.

Both officers will report directly to president and general manager Donald S. Leslie.

Former president of Old Colony Envelope and Strathmore Paper Cos., Mr. Zink joined Hammermill in 1946 as administrative assistant in the sales department. The following year he was promoted to assistant vice president, in 1948 to vice president and director of merchandising and in 1953 to vice president, assistant general manager and director of merchandising.

Mr. Zink at the annual meeting of the Writing Paper Manufacturers Assn. on February 18 was elected Vice President and Chairman of the Sulphite Bond Group.

John H. DeVitt began his Hammermill career in 1922, worked briefly in the finishing room, the laboratories and as an engineering draftsman before settling in the accounting department in 1926.

In 1932 he was named assistant auditor, the first in a series of promotions which saw him move up to director of the budget in 1942, controller and head of the accounting department in 1944, assistant treasurer in 1948 and treasurer in 1953.

Rayonier Promotes at Fernandina

E. P. Wilson has been promoted to assistant superintendent at Rayonier in Fernandina, Fla. He joined Rayonier in 1937 and was named assistant chief chemist in 1954 and shift superintendent last year.

Replacing Mr. Wilson as shift superintendent is Joe Verlardi. Since 1953 he has been process chemist, process engineer, water plant and bleach plant superintendent.

W. E. Saunderson, process chemist and process engineer, will replace Mr. Verlardi as bleach plant superintendent.

R. T. Teague Jr. has been promoted to laboratory supervisor to replace Billy Catherwood who transferred to operations as process engineer.

St. Regis Names New Supt. at Tacoma

S. P. Strayer, a St. Regis Paper Co. chemist, has been named assistant to the general mill superintendent at the Tacoma, Wash., plant.

Mr. Strayer, who was formerly assistant chief chemist of the pulp mill, has been associated with St. Regis since 1945.

Robert F. Lynch, assistant chief chemist of the paper mill, has been named assistant chief chemist of both the pulp and paper mills. Mr. Lynch has been with St. Regis since 1948.

Sears Hurt

Alden Sears, chief accountant for the Missisquoi Corp., Sheldon Springs, Vt., manufacturers of paperboard specialties, has been a patient at St. Albans Hospital. He suffered a back injury while skiing in Underhill.

Thomson Elects Joachim VP

Thomson Paper Mills Inc. has elected Herman L. Joachim executive vice president. Thomson is planning to double its production within the next few months, with the installation of a new wide high-speed paper machine. Mr. Joachim and Stanley Crumpler, superintendent of the plant, will be responsible for the installation of the machine.

For the past two years, Mr. Joachim has served as mill engineering consultant for Thomson Paper Mills, operating from his independent offices in New York and New Jersey. Thomson will move its main office in New York City on April 1 from 347 Madison Ave. to a new skyscraper under construction at 375 Park Ave.

CZ Announces Staff Changes

Crown Zellerbach has announced the following staff changes:

John M. Lowry, groundwood mill shift foreman, West Linn, to groundwood mill superintendent, West Linn.

James E. McCourt, technical assistant to the paper mill superintendents, to paper machine room shift foreman.

George Purvis, Gaylord senior industrial engineer at Bogalusa, to assistant superintendent, Gaylord Dallas plant.

Frank W. Moulton, associate engineer, central engineering, Seattle, to technical assistant, steam and power, Lebanon.

Walter Vastrick

New Head of Allied's Kalamazoo Mills

Appointment of Walter Vastrick as director of quality control for the Kalamazoo mills has been announced by Allied Paper Corp. Allied's King, Monarch and Bryant division mills are located in Kalamazoo. Mr. Vastrick was formerly technical control superintendent of the Bryant mill.

Paul K. Honey

G. A. Tougas

O. L. Wakeman

Named Div. Manager of Buckeye Cellulose

Paul K. Honey, vice president of Buckeye Cellulose Corp., has been promoted to the newly-created position of manager of Buckeye's Cellulose & Specialties Division.

G. A. Tougas will succeed Mr. Honey as the company's manager of Florida operations. O. L. Wakeman succeeds Mr. Tougas as manager of Buckeye's Foley, Fla., mill.

Mr. Honey will make his headquarters in Memphis, Tenn. Previously responsible for all Florida activities of Buckeye and the cotton linter pulp manufacturing facilities in Memphis, he will now direct all Buckeye pulp operations, including research, manufacturing and sales. He will report to Walter L. Lingle, Jr., executive vice president of Buckeye's parent company, Procter & Gamble.

Mr. Tougas will be responsible for all Florida activities, including manufacturing, wood procurement, forestry, construction and employee relations. He will be headquartered at Foley and will report to Mr. Honey.

Mr. Wakeman, who has been construction manager of the Foley expansion project, will be succeeded in that position by Charles Montague, who goes to Foley from Buckeye's Memphis headquarters.

Marsh Heads Spaulding's New England Div.

Robert D. Marsh, who has been manager of the Dover, N. H. plant of the Spaulding Fibre Co. Inc., has been named assistant manager of the New England division of the firm, with headquarters in North Rochester, N. H.

Mr. Marsh, who joined Spaulding in 1924, was manager of the Rochester plant before its operations were transferred to Dover some 15 years ago. His successor as manager of the Dover plant is George Janetos, assistant plant manager in Dover since 1952.

Newark Boxboard's Boffey Retires

William J. Boffey, general manager of Newark Boxboard Co., Newark, N. J., retired March 1 after 36 years of service with the company. Under his management the production of the mill was increased from 35 to 75 tons daily.

Mr. Boffey is well known in the board industry, having been an active member of the National Paperboard Assn. and a director for three years. In addition he was for two years chairman of the Eastern Group of that association and a director of the Conservation Committee, Wastepaper Consuming Industries.

Edward K. Mullen, who recently resigned as national sales manager of boxboard products, Robert Gair Div., Continental Can Co., New York, has joined Newark Boxboard Co. as vice president and succeeds Mr. Boffey as general manager.

Warren Elects Director

Rudolph T. Greep, mill manager at S. D. Warren's Cumberland mills plant, has been elected a director of the company. He joined Warren in 1934 as a research chemist. Other directors were re-elected.

STOPS JUNK IN ITS TRACKS . . .

Junk and heavy dirt traveling along with the stock as it leaves the pulpers get no chance to go on and damage expensive equipment or get broken up into fine dirt — not with Bird Centrifflers standing guard.

The Centriffler takes stock from the pulpers diluted to about 1½% and delivers up to 1500 gallons of cleaned stock per minute.

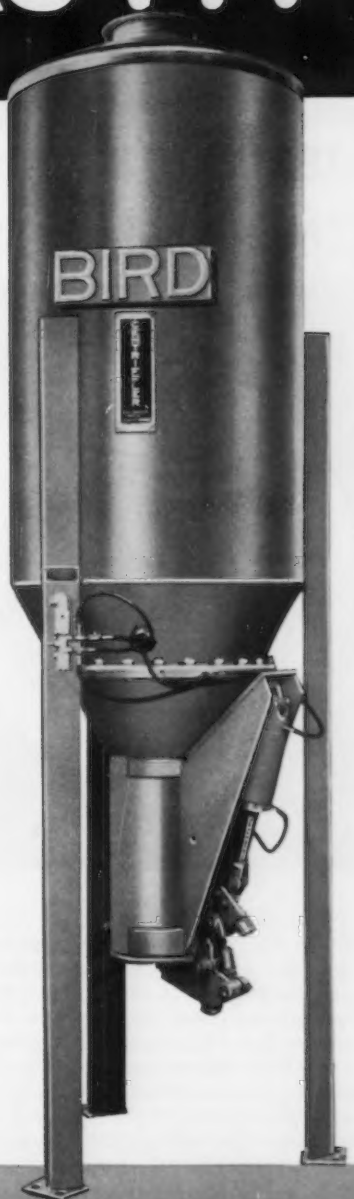
It has no moving parts and takes up only a fraction of the space required by the old, cumbersome riffler.

The stock may be delivered to the Centriffler by low head pump or by gravity feed. High pressure (50 lb.) stock discharge can be provided so that stock can be delivered to regular drop-in-pressure dirt removers, like Dirtecs, without pumping.

BIRD MACHINE COMPANY
SOUTH WALPOLE, MASSACHUSETTS

REGIONAL OFFICES: EVANSTON, ILLINOIS
PORTLAND, OREGON • ATLANTA, GEORGIA

Canadian Manufacturers of Bird Machinery
CANADIAN INGERSOLL-RAND CO., Limited, Montreal



BIRD CENTRIFFLER

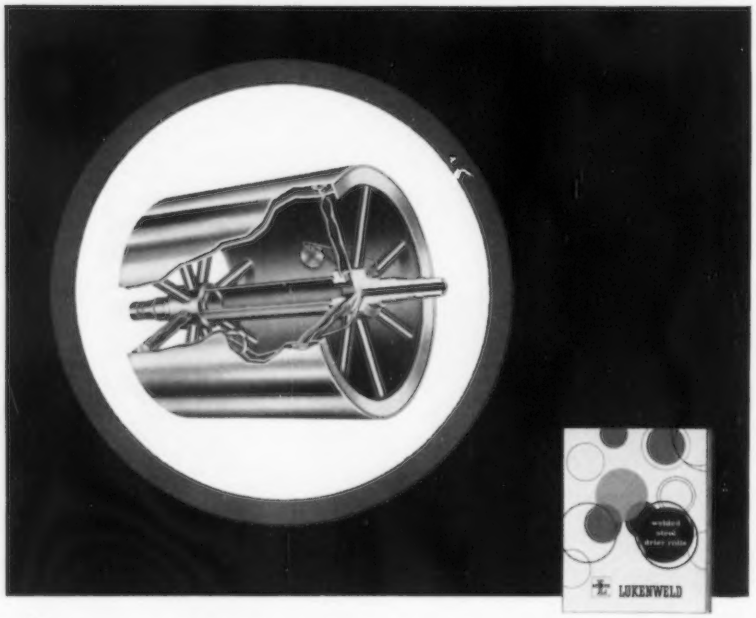
This Bird Centriffler is equipped with an automatic dumping device. Quick acting manual dumping mechanism is also available.

NEWS OF CONVERTERS

Whiting Patterson Elects Officers

Whiting Patterson Co. Inc., Philadelphia, has announced that R. W. Fishburn has moved up from president to chairman of the board. Willson Whiting, formerly executive vice president, was made president, and the following officers were re-elected: R. C. Fischer, secretary and vice president in charge of Envelope Division; R. D. Perry, vice president in charge of Paper Division; Franklin Kurz, treasurer; Samuel Walker, assistant vice president in charge of envelope production.

Lukenweld Yankee Driers speed output, up safety!



Lukenweld all-welded Yankee drier rolls can be built to safely withstand steam pressures well over 200 psi. You can purchase them in any size, subject only to shipping limitations. Welded into one piece, they have no bolted end heads. There are no heads to crack, no gaskets to blow. Maintenance costs go down.

The light gage outer shells of homogeneous high-strength rolled steel plate provide better heat transfer. You get uniform drying over entire shell surface. Start-up time is fast. Product quality can be improved, costs cut, floor space reduced.

And the same roll is often used to dry many different types of paper.

GET THIS BOOKLET NOW
Write today for WELDED STEEL DRIER ROLLS, an illustrated booklet of facts you can use. Address Lukenweld, 174 Lukens Building.

LUKENWELD
A Division of LUKENS STEEL COMPANY
COATESVILLE, PENNSYLVANIA

LUKENS ®

New Location for Paper Converting and Finishing Co

Paper Converting and Finishing Co. has announced that it is moving to a new location at 1101 S. Kilbourn Ave., Chicago, Ill. A fifteen-year lease has been signed on a two-story fireproof building, with over 65,000 sq. ft. of floor space. This move will replace three former locations which will now be consolidated into one plant.

Certified Box Leases Springfield Plant

Certified Box Corp. has leased a plant in Springfield, Ill. where it expects to employ 160 persons on two shifts manufacturing corrugated boxes.

William J. Gass, president and general manager of the firm, said actual production is expected to be under way in about 60 days and that the newly formed corporation is presently being chartered under Illinois laws.

The leased building is a temporary location in which to get under way with limited production, Mr. Gass said. "Eventually we hope to acquire or build about 80,000 sq. ft. of space in which to run a complete converting operation, actually converting the raw paper into corrugated, as well as manufacturing boxes of various sizes."

Bemis Appoints Product Planning Head

E. C. Whitmore has been appointed to the newly created position of director of product planning for the Bemis Bro. Bag Co.

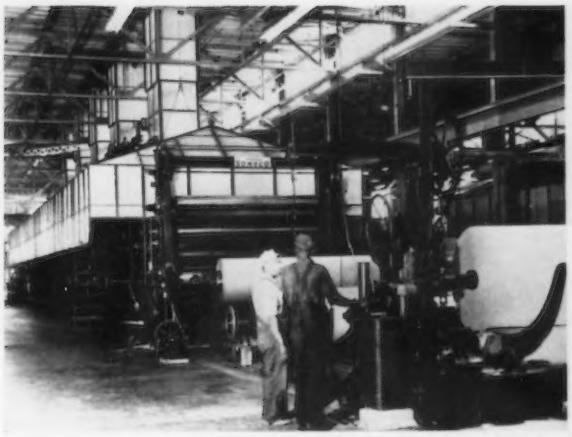
Prior to accepting his new position, Mr. Whitmore was affiliated with Textron Inc., where he served as assistant to the president. Other positions held within the organization included that of executive vice president of the Atlantic Parachute Division, president of Textron Puerto Rico, and president of the Ryan Industries Division.

Hoch Named Endura VP

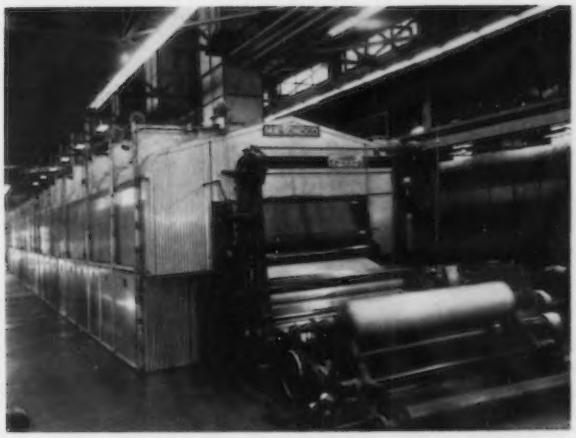
Endura Corp. has appointed Richard C. Hoch as a vice president. He has since 1950 been active in research and development for Endura.

CZ Appoints Rice

Crown Zellerbach has appointed Robert Rice to be superintendent of Gaylord's new Plymouth, Mich. plant. He has been assistant superintendent of the Gaylord Dallas plant.



Sonoco's 140-inch, 62-drier paper machine prior to installation of totally enclosed hood.



Same paper machine as it exists today, with Ross-Hooper totally enclosed hood.

Totally Enclosed Hood Pays for Self in One Year at Sonoco

Increases Production 10%, Cut Steam Requirements 7%

Sonoco Products, Inc., Hartsville, S. C., has increased production by ten per cent and decreased steam consumption seven per cent by replacing an open-type paper machine hood with a Ross-Hooper totally enclosed hood.

The company replaced the hood on a 62-drier, 140-inch fourdrinier. The new hood paid for itself in increased production and reduced steam requirements in about one year and, in addition, has resulted in more uniform moisture content across the sheet, 40 per cent less exhaust air and exhaust-fan horsepower, and more comfortable working conditions around the machine. The old hood was removed and the new one installed during a two-week shutdown.

Hood Construction

The totally enclosed hood is made of custom-made, prefabricated panels. Roof panels consist of double aluminum sheets which encase three-inch thicknesses of glasswool insulation. The lower panels on the drive side slide sideways to provide access to driers, gears and steam lines. Lower panels on the tending side slide upward by motor-driven windlass arrangements. When they are up, the side of the machine is entirely clear of obstructions and machine tenders have complete access to the driers. All panels rise in unison, automatically, in event of a break in the web. These panels may also be raised in sections by push button control, affording entrance to any individual section.

End panels provide for minimum openings when the sheet is on the driers. Counterweighted man-size access doors are provided at each end and the wet end has a lifting panel large enough for threading the sheet. Other end panels are bolted in place.

No. 8 machine has an open pit which necessitated running the enclosure to the basement to obtain full circulation control and avoid unevenness in the air flow due to pulling air up through the pit. The basement enclosure consists of corrugated aluminum bolted in place, access doors being provided for personnel and removal of broke.

Advantages Obtained

Approximately 40 per cent less air is now handled than formerly. This smaller volume of exhaust air enables more of the heat from the driers to be used in drying the paper and results in more rapid drying and higher production speeds. In addition, the number of exhaust fans has been decreased from seven to four.

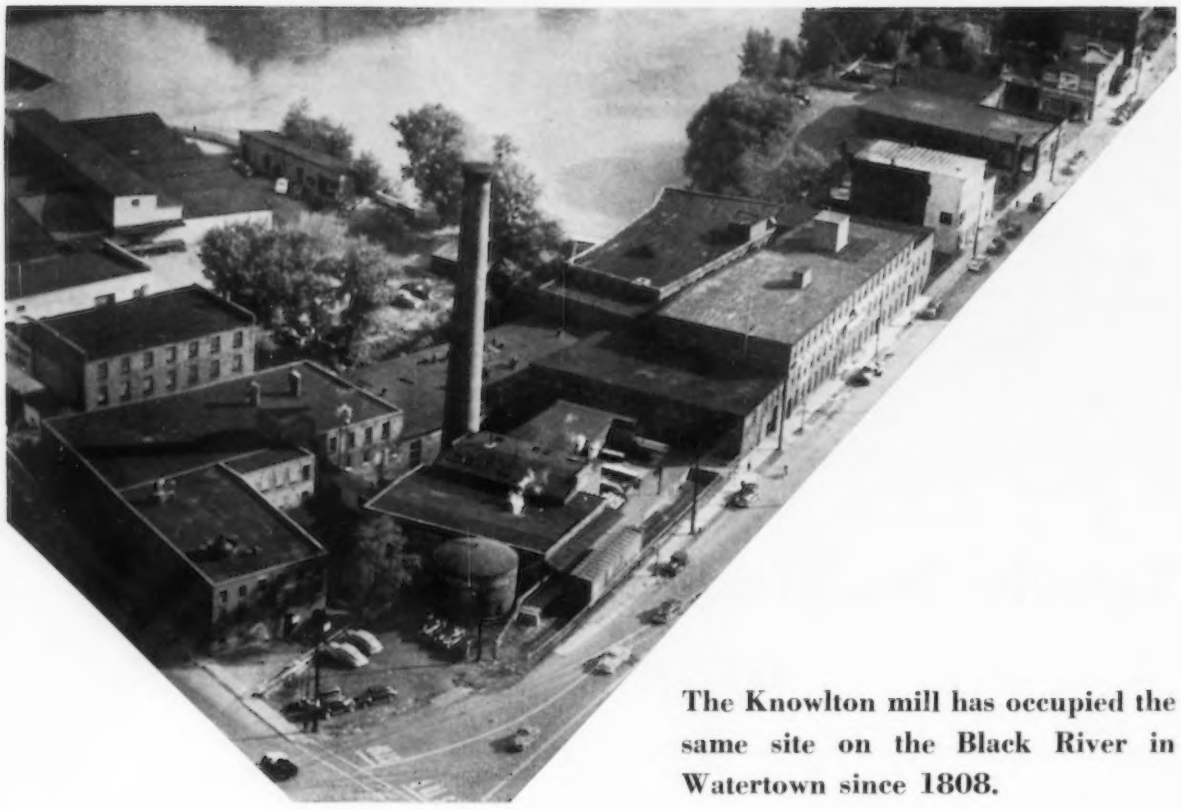
The improved air system also has provided another important benefit. It has decreased the variation in moisture content across the sheet. Formerly, this variation was at times more than two per cent, giving rise to subsequent gluing and lamination problems. Variation is now usually less than one per cent, eliminating these difficulties.

Working conditions about the machine have been greatly improved.

No. 8 machine is partially clothed and Sonoco feels that it is getting better felt performance since installing the totally-enclosed hood.

A major portion of the make-up air for No. 8 machine is supplied by a Ross felt-drying unit which blows high velocity heated air against the bottom surfaces of the return felts, the air being supplied through nozzles spaced across the width of the felt. This supply is augmented by an air make-up unit which blows additional heated air into the basement enclosure to maintain proper balance.

In discussing the totally enclosed hood, P. L. McCall, superintendent, pulp plant and No. 8 machine, states that in his belief no equipment of recent years has been of as much benefit to the mill.



The Knowlton mill has occupied the same site on the Black River in Watertown since 1808.

Knowlton Brothers Marks 150th Anniversary

Specialty papermaker starts last half of second century going strong.

Knowlton Brothers, Watertown, N. Y., manufacturers of special industrial papers, is celebrating its 150th anniversary this year. Among the festivities was an anniversary banquet held on January 26. Featured speaker at the banquet was David L. Luke, president of A.P.P.A. and the West Virginia Pulp & Paper Co.

An open house for employees and their families on the 27th, and for the community of Watertown on the 28th, included conducted tours of the mill, demonstrations of various equipment and processes, and exhibitions of products utilizing special papers.

David C. Knowlton, president of Knowlton Brothers, also addressed the employees, their husbands and wives, at the banquet. Mr. Knowlton reviewed the 150-year history of the company, and concluded with a four-part "recipe" for business longevity:

"Quick adaptability to new methods, new products, new materials;

"Constant research toward better and dissimilar products;

"Recognition of labor as a partner based on voluntary determination to cooperate with one another;

"A sense of civic responsibility."

The Mill

Knowlton Brothers recently completed a modernization and expansion program which included installation of a pilot paper machine, a new development and research laboratory, and electronic quality control apparatus.

The company for most of this century have been experts in the production of special industrial papers. The company's two machines, both of which are over 50 years old, are ideally suited to the nature of this type of production.

No. 1 fourdrinier machine has a speed range from 10 to 300 feet per minute and with a maximum trim of 58

inches. In mass production paper manufacture, a full trim is desirable, but Knowlton Brothers is quite willing to run a 36-inch trim if it is required by a customer.

No. 2 duplex machine is one of only a few of its kind in the country and was the first such to be operated in the United States. It consists of a fourdrinier and a cylinder section. The latter has three cylinder. The machine can, therefore, in one operation combine the advantages and characteristics of both cylinder and fourdrinier papers. It can make a sheet colored on one side and white on the other—etc. This machine trims 80 inches and operates at speeds from 40 to 300 feet per minute.

Wires on both machines can be changed quickly to different mesh size which provides flexibility in sheet characteristics, and No. 1 machine for the same reason can change from a suction to a solid couch in 40 minutes. This is papermaking, indeed, at its most flexible.

Many Unusual Grades

Among its many interesting grades the mill produces papers for: shot gun shells; oil, air and fuel filters, saturating and impregnating papers, gas mask filters, photographic wrapping and interleaving; radio and TV loud speaker cone paper; gasket and tape backing; and electro-sensitive facsimile papers.

A typical problem posed to Knowlton Brothers was presented in the 1930s by Western Union. Western Union wanted a paper which could be used on its telefax machines for automatic transmission of messages. Knowlton proceeded to develop a carbon-filled sheet which will conduct electricity, and which can then be coated for automatic reproduction of messages. This paper has served satisfactorily through the years, although it is constantly being improved.

Another specialty problem was the development of a high temperature inorganic filtration medium for filtering fluids reaching as high as 600°F. Since any alpha cellulose sheet will char at 300°F, it was necessary to turn to other fibers. A ceramic fiber was finally determined best, but the next problem, which was successfully met, was to find a binder that would hold these fibers and that would also stand up under these same high temperatures.

In the field of filter paper manufacturing, where Knowlton Brothers specializes, the company has combined a gauze textile-fiber web with paper on its fourdrinier—all in one operation and the first time without use of an adhesive. Another filter medium combining a blend of fibers was developed for separation of water from jet plane fuels.

David C. Knowlton

Fifth Knowlton to hold the presidency and fourth generation member of the family is genial, friendly, and widely known Dave. During the ten years of his presidency the company has grown and been strengthened. Mr. Knowlton is active in many civic affairs and in the associations of our industry. He is a past president of the Assn. of Pulp Consumers, member of the Board of Governors of A.P.P.A. and was elected vice-president of Specialty Paper and Board Affiliates Inc. for 1958.

The manufacture of artificial leathers must start with a low density porous paper which can then be impregnated with latices. These impregnants are often used to make a flexible, strong, leatherlike material which can be used in shoe manufacture, brief cases, catalog book covers, hat sweat bands, belts, etc.

History: 1808-1958

A brief look at Knowlton's history tells an interesting story of growth and development.

The company had its beginning in 1808 when Gurdon Caswell, a Utica tailor, came to Watertown and built two small paper mills. One was in the neighborhood of Factory Square, while the other one was situated on the present site of the beater room of Knowlton Brothers. At that time, paper was made by hand, since continuous machinery had not yet been invented.

In 1824, George W. Knowlton and Clark Rice, both from Brattleboro, Vermont, purchased the two mills, as well as a book store, a bindery and a printing shop. The last three were finally sold to Hall and Chamberlain, but the "Pioneer Mill" continued to make paper until 1833 when the land was sold and the building moved further upstream.

Finding it difficult to sell a great quantity of paper, the two men started to use their own products and printed and published school books, blank books, and even an almanac-cookbook. Almanacs in those days were read in every family and were considered just as essential as the family Bible.

Fire burned one of the mills and the printing plant in 1833, but both were rebuilt with better equipment and added facilities. Two rag machines were installed as well as the first cylinder machine. Again in 1848, fire destroyed the mill, which was replaced with a brick structure.

During the five-year period from

KNOWLTON MILL 90 YEARS AGO. This photo, taken in 1867, shows Knowlton Brothers' Paper Mill (X) and the Union Mill (O). The brick structure was built in 1848, after fire had destroyed the mill.

PILOT PAPER-MAKING MACHINE, duplicating Knowlton's production facilities on a smaller, test scale, is demonstrated to employees and their families at company open house, part of three-day anniversary program.

1855 to 1860, Charles Brown and Edward Chamberlain operated the Knowlton and Rice mill. Meanwhile, George W. Knowlton Jr., who started working for the company in 1856, and his brother, John, decided to enter the paper industry. In 1861, they became principals in their father's business.

The brothers operated the mill during the Civil War and a few years after its conclusion installed a new fourdrinier machine. For the next 40 years, this machine made all kinds of paper, from newsprint to colored writing paper. Six original driers of this machine are still in working order today.

About 1888, John retired from active management of the company. The partnership of Knowlton Brothers, however, existed until 1892, when the firm was incorporated.

Because of continuous expansion of the industry, a large addition to the Mill Street plant was made in 1905. Electric power was installed and Knowlton Brothers became the first paper manufacturer in the city to adopt electric power for paper making.

In 1907, a second and larger machine, including both cylinders and fourdrinier part, was installed to make duplex or two-ply red and black photograph wrapping paper for Eastman Kodak.

John died in 1919 and the mill continued under the leadership of his brother, who gradually turned over its management to his eldest son, G. Seymour Knowlton. In 1932, Seymour's brother, Theodore, came to Watertown and assumed management responsibility of the company. A civil engineer by profession, he realized that, if it were to continue in business, the mill would have to adapt itself to the manufacture of paper specialties rather than ordinary types of paper. The next decade was devoted to the research and development of such products.

During World War II, the firm played an important part in the war effort. Its paper was used in gas masks and many of the mill's other products carred high war-time priorities.

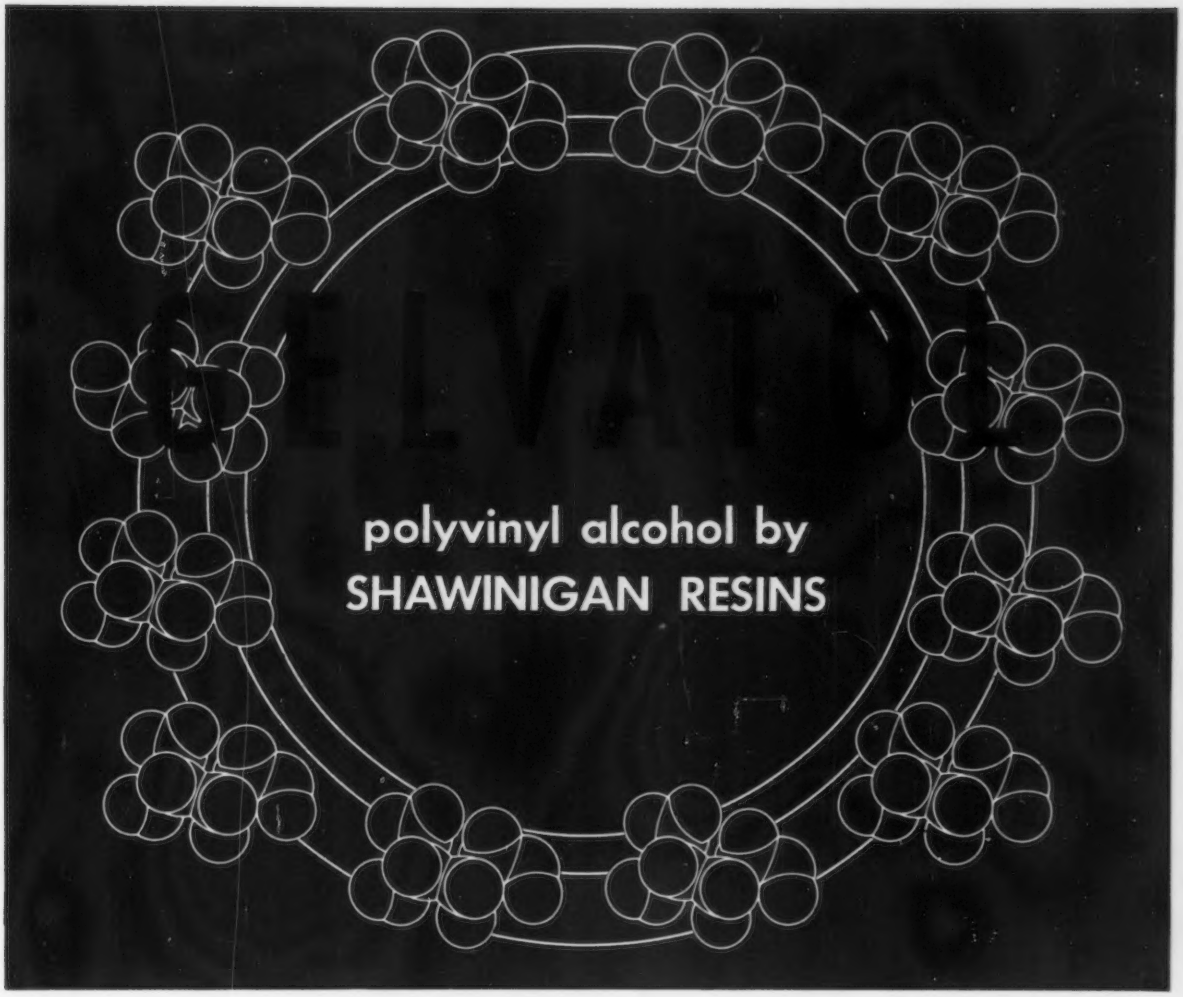
EXHIBIT OF PRODUCTS using Knowlton papers includes automotive filters, facsimile telegrams, shot-gun shells, printed circuits, and protective papers for film and x-rays.

Present Day Picture

An extensive modernization program was launched after the war which made the mill one of the best equipped of its size in the industry.

In 1948, David C. Knowlton, son of Theodore, was elected president of the corporation, a post he now holds. He is the fourth generation of his family to hold this office.

Ever expanding, the company installed a pilot paper machine in 1955 for research and development of new products. The addition of a new research laboratory has enabled experimentation with unusual natural fibers and synthetic fibers. Paper containing glass, nylon, dynel and ceramic materials has already been manufactured. Two paper machines and their accessories have a maximum of flexibility and enable the company to produce a wide range of products.



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Twelve grades of commercially proved GELVATOL now are at your disposal for more efficient, more profitable formulating. This series of resins is of unequaled quality and uniformity . . . features which have been proved on the production line.

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Standard grades of GELVATOL are suitable for all applications including adhesives, textile sizes, paper coatings, and films. What's more, the new, extremely low viscosity grades offer a unique combination of properties for specialty applications.

Whatever your needs, remember that in GELVATOL there is the *right* grade for you. Write today for full technical information and sales service, to Shawinigan Resins Corporation, Dept. 6310, Springfield 1, Mass.

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Nopco wax sizes assure positive wax retention in the fibers . . . thorough and even wax distribution through the sheet . . . high efficiency at low cost.

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Ask our nearest representative for full details on Nopco wax sizes and services or write to us. Nopco Chemical Company, Harrison, N.J., or Richmond, Calif.

Depend on Nopco Wax Sizes to do all these things:

Improve properties which are difficult or impossible to obtain with rosin sizes

Lower your sizing costs by replacing 30% to 50% of rosin size

Improve the sizing of fortified rosin sizes

Enhance the surface qualities of your paper and board, when used either alone or in conjunction with starch or other film-forming materials

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A SHOT OF | MODERNIZATION UPGRADES PRODUCTION

Machine performance is bound to suffer, productivity sure to drop, when one or more sections of a paper machine are lagging due to old age or excessive wear.

Black-Clawson, having assisted hundreds of mills by rebuilding or modernizing all types of paper and board machines and auxiliary equipment, has seen the benefits gained by a realistic attitude toward obsolescence.

Stimulating performance of an ailing machine with a shot of modernization upgrades production . . . loosens the squeeze on mill profits.

Black-Clawson has the "specialists" and the cures. Let us examine, diagnose and prescribe for your machinery ills.

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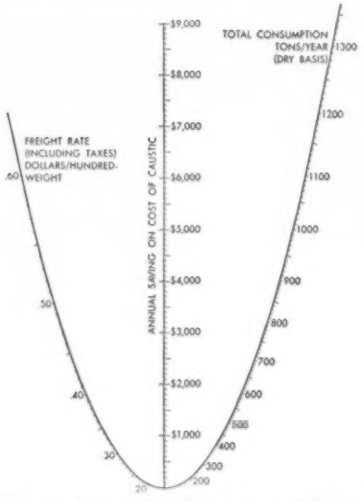
BRIEFS
for caustic soda buyers

50% or 73%? Choosing a supplier New producing point

50% to 73%— some save, some don't

To estimate quickly whether you can save by switching from 50% to 73% liquid caustic soda, simply draw a line on this nomograph.



Start at your freight rate and draw to your annual consumption in tons, dry basis. Your approximate savings on freight will appear where you intersect the center line.

From this figure, subtract annual depreciation for dilution equipment. (We'll be glad to advise you on cost of this equipment.)

If you still show a saving, it would be wise to consider the big switch seriously.

For more facts on the economics of 50% and 73% caustic, check the coupon for a copy of our pocket-size *Caustic Soda Buyer's Guide.*

And for specific technical advice centered on *your* requirements, just phone or write the nearest Hooker sales office.

Choosing a supplier

Service is a large part of what you pay for when you buy caustic soda.

Here are some important "service" points to look for when you're considering a source of supply. (As a Hooker customer, you enjoy *all* of them.)

1. Supply security. How flexible are your supply lines? For instance, a supplier with plants and stock points on deep water may be able to offer you a choice of rail or water delivery. This can assure you steady supply in case of rail service interruption.

2. Realistic contracting. Your agreements with your supplier should realistically reflect your expected needs *and* the supplier's ability to consistently deliver the tonnage you need. Best yardstick for measuring this ability is a supplier's performance record. Hooker, for example, has an unbroken 50-year record of fulfilling contract commitments.

3. Engineering help. A supplier's engineering staff can help you set up a new caustic handling system—or revamp an old one—with advice, and with actual design assistance.

4. Safety programs. The men in your plant who handle caustic soda can benefit from safety suggestions offered by your supplier. You should have on tap the latest in safety equipment, plus up-to-date information on the safe handling of caustic soda.

We'd be happy to enlarge on these points, with your caustic requirements in mind. A phone call or note to the nearest Hooker sales office will bring you the specifics.

New source on stream

Put a pin just north of Vancouver, B. C. on your map of caustic soda supply points.

Here in the city of North Vancouver, a new $11 million chlor-alkali plant is now on stream. The plant was built and is operated by Canadians for industry in Canada.

The new Hooker Chemicals Limited plant is Canada's first domestic source of caustic soda and chlorine west of the Rockies. It shortens supply lines, provides small but real freight savings, eliminates the need to pay duties on caustic and chlorine, and makes for faster all-around service.

If your company is already operating plants in British Columbia, or plans to build in this great, growing territory, this is a good time to discover how Hooker Chemicals Limited can serve you.

Check items you'd like to receive:

☐ *Caustic Soda Buyer's Guide.* Lists advantages of 50% and 73% solutions; comparative costs; capacities of tank cars and other containers; useful shipping information.

☐ Technical data on caustic soda.

Need information on these other Hooker products used in the pulp and paper industry? Check here for technical data sheets:

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☐ Pulp Bleaching
☐ Sodium Sulfide
☐ Sodium Sulfhydrate

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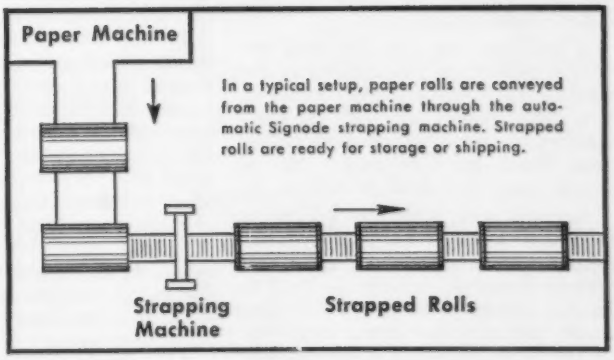
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Theory and Mechanics of Refining Stock for Paper and Board Manufacture

A practical discussion of the subject with data from a survey of actual systems for a wide range of papers and boards.

A. J. Feltman

Senior Project Engineer
Shartle Division
Black-Clawson Co.

The theory and mechanics of refining is very controversial. If you assemble ten papermakers you will have ten different opinions of how to refine cellulose fibers.

The first thing that we must agree on is "what is refining?" Everyone sees things just a little differently. Refining to me is the preparation of the papermaking fiber so that a sheet of paper can be produced that meets the purchaser's specifications.

It has been said that the most important process in papermaking is the refining one. Without it paper would be soft, fluffy, porous and unfit for most commercial uses. Refined stock on the other hand produces paper that is strong, dense and hard in texture.

Slowness and hydration are terms used rather loosely in our industry. They mean one thing to one papermaker and perhaps something different to another. In our studies here the terms fiber length reduction, shortening or slowing up are to be considered as cutting. The terms brooming, fibrillation, attrition or wetting are to be considered as hydration.

The stock refiner utilizes wide bar (½-¾ inch) tackle operating at high speeds, 5400 to 6000 f.p.m. with low horsepower connected for the high speed and relatively high stock consistency (5%-6%). The high speed and large areas of bar prevent close intimacy of the bar structure at the relatively low horsepower connected.

Any attempt to bring it into cutting intimacy or comparable intimacy of the jordan would tend to stall the unit.

High consistency is employed so that the film of stock filling the annular ring about the rotating element will result in good fiber contact. The refiner, because of its high speed and wide bar tackle always operates at fiber diameter clearances (.0027 inch).

The use of 431 stainless steel in the refiner provides a material that work hardens during operation and the bars round off at the leading edge. You all have had the experience of examining stainless steel tackle in jordans and found that the leading edge was very blunt and some feathering or flowing of metal on the rear of the advancing bar. This material characteristic enhances the development of tear strength due to the pounding effect on the fiber rather than the shear effect of a sharp edge which would reduce its length.

The refiner provides good tear development, a reasonable increase in mullen and tensile strength, relatively no fiber length reduction and all of this is accomplished with a very slight drop in freeness. Due to this operating characteristic it cannot do the job of jordans.

Jordan

The basic thinking behind jordaning as we know it in paper and board mills comprises the use of narrow bar tackle, low peripheral speed 2000/3000 f.p.m., high horsepower for the low speed and relatively low consistency (3%-3½%). The cutting jordan employs narrow tackle ¼ inch thick.

The large amount of horsepower connected permits the operator to place the jordan in close intimacy or in bar-to-bar metal contact without stalling the connected motor. In 1944 Mr. Gathshore in works published in German periodicals contends that, in hundreds of tests that he made, the jordan works very close to seizure point. By this he meant that at the low consistency the bars were so close together that any amount of forward travel of the jordan would stall the unit. Mr. Gathshore contends in his papers that the thin film of stock at low consistency did not act as lubricating medium but rather only assisted in laying of the fibers in the bar structure so that they could be cut.

The use of heat-treated steel or phosphor bronze provides a material that tends to remain sharp at the leading edge and keep the fibers in position for shear loads. Phosphor bronze is by far the best cutting material since it wears uniformally and normal to the area of the shell bars. This provides a very sharp leading edge and those of you who have examined bronze filled jordan after it has been in operation

for some time have found razor-like leading edges and uniform wear pattern. Heat treated CNM alloy is next in preference for this duty and by periodic reversing of the jordans, the operator is assured that he is getting the maximum cutting effect of the engine.

The jordan enhances mullen, tensile and controls porosity. Fiber length reduction and wire drainage rate is also a function of jordan treatment. Since fiber length and wire drainage rate is synonymous with freeness, a sharp drop in freeness is also experienced.

Modified Jordan

In order to obain the maximum refining treatment and yet secure some jordaning characteristics, many mills have installed jordans having ⅜ inch duplex plug and shell bar structures. This arrangement gives large contact area and prevents the operator from setting the jordan up to bar-to-bar contact. This treatment provides reasonable tear development and good mullen and tensile development.

Comparing Results

We have just covered the design of engines designed for:

1—Hydration

2—Cutting effect

3—Modified or combination of both It would seem logical now that we present data to substantiate these claims.

Table II gives data obtained from actual commercial machines under strict laboratory control. Let us take the table under "Hydration." This was a refining engine having the general operating characteristics described to you and let us examine the results. Note that I have selected a common yardstick, 30 h.p. days per ton which is a mathematical interpolation to assure that all results are on common ground.

With the hydrating machine we had a freeness of 705, a fiber length index 3.31, a porosity of 1.83 and a tear of 16.05. The "Modified" refiner where we expect to obtain some of the cutting features as well as hydration, has dropped the freeness to 610, the fiber length has been greatly reduced .58 and porosity has increased to 3.7. Finally, on the "Cutting" engine, the freeness has dropped further to 487, the fiber length has reduced to .36, porosity increased to 8.4 and the tear never exceeded 13.

Now what do these tests show?

1—That the hydrating machines give maximum tear development with minimum change in fiber length and in freeness as represented by 3.31 and 705 respectively

2—The modified engines gave a great deal more cutting effect as indicated by the tremendous reduction in fiber length—reference .58 and freeness of 610.

No tear test was made since this was conducted on the premise that we could predict what we would obtain.

Finally, the cutting engines have still further reduced fiber length and freeness as indicated by .36 and 487.5 freeness. Yet all of these stocks were identical prior to treatment. It is our experience in many laboratory trials using commercial size equipment and put-through rates but operated under very rigid test and control methods, that these general characteristics hold true.

By virtue of statistical analysis of not only stock treatment effects but bar areas, pressures and thrust loads, we have devised a means of determining what each of our refining engines will do under certain operating characteristics so that we could better serve the industry.

Use of Lava Plug

For extreme hydration the modified jordan employs a lava plug and Bidwell shell. Our pilot experience indicates that the stone plug and Bidwell shell provide for uniform hydration and freeness drop exceeding that obtained with a standard refiner. The refiner provides initial hydration and freeness drop for a reasonable period and then rapidly decreases in efficiency. This work was conducted with stainless steel fillings. The use of lava plug and Bidwell shell however, provided for uniform treatment throughout the range inherent to the furnish. The simple explanation is that we found that the standard refining engine worked very well for the initial rise in tear and drop in freeness but that it leveled off and no effect was obtained for considerable additional horsepower. However, in the lava plug and Bidwell shell unit the hydration curve and freeness drop was

TABLE I—COMPARISON OF JORDANS AND REFINING ENGINES

	Refiner	Jordan
H.P.	Lo—400 H.P.	Hi—400 H.P.
Speed	Hi—5400-6000 FPM large end.	Lo—2000-3000 FPM large end.
Intimacy	Fiber diameter .002" clearance.	Bar to bar .0001", metal to metal.
Bar-Width	Wide bar ½-¾", large contact area.	Narrow bar, ¼", small contact area.
Material	431 stainless, work hardens, rounds off leading edge.	Phosphor bronze, heat treated steel. Normal wear pattern.
Consistency	Hi—5-6% heavy mat.	Lo—3-3½% no mat.
Effect	Hydration	Cutting fiber length red.
System	Continuous or Batch	

TABLE II—COMPARING RESULTS FROM THE THREE TYPES OF ENGINES

HYDRATION

Cotton Linters "A"						Cotton Linters "B"				
Run 2 Sample	HP/T/D	CSF	Flit	Poros.	Tear	Run 4 Sample	HP/T/D	CSF	Flit	Poros.
8	20.0	737	4.54	0.9	13	21	25.4	697	1.94	13.4
9	29.77	707	3.35	1.8	16		30	668	1.58	17.9
→	30	705.24	3.31	1.83	16.05	22	37.5	621	1.00	25.2
10	39.54	632	1.52	3.2	18	23	49.6	501	.58	54.0
11	49.16	532	.75	8.7	23					

MODIFIED

Run 1 Sample	HP/T/D	CSF	Flit	Poros.	Tear	Run 3 Sample	HP/T/D	CSF	Flit	Poros.
2	9.20	748	3.32	1.15		15	10.2	740	3.25	3.1
3	18.3	706	1.45	2.05		16	20.3	685	1.18	8.8
4	27.4	642	.65	3.3		17	29.5	575	.59	18.3
→	30	610	.58	3.7			30	570	.57	18.9
5	36.10	535	.42	4.5		18	37.4	491	.35	27.0

CUTTING

Run 5 Sample	HP/T/D	CSF	Flit	Poros.	Tear	Run 6 Sample	HP/T/D	CSF	Flit	Poros.
26	9.32	708	1.81	2.2	11	32	10.8	710	1.21	62
27	18.4	610	.72	4.3	13	33	21.6	633	.5	11.5
28	27.7	514	.39	6.6	13		30	551	.36	17
→	30	487.5	.36	8.4	13	34	32.7	524	.31	18.8
29	36.8	409	.26	13.9	13	35	43.5	438	.18	36.3

CSF—Canadian Standard Freeness
FLIT—Fiber Length Index

The term "Hydration" refers to the characteristics that are easily recognized by feel of the stock. Sometimes it is confused with slowness which refers to the stock drainage rate on the wire.

constant and almost straight line function of input horsepower.

Pressure Jordaning

There is much to be learned about pressure jordaning. Quite recently H. W. Emerton reported on the work of Wardrop and Dadswell, Jayne Hunger, James Wardrop and Emerton and Goldsmith and reports evidence that soft and hardwood fibers are tubular in nature and have cell structure walls longitudinally spaced. The void in the fiber is initially filled with air.

Since we agree that hydration is the increasing of wetted surface of the fiber, increasing the amount of water the fiber carries, fibrillation and brooming of the ends to retain water, these papers reported on by Emerton gain importance when considering pressure jordaning. Since water is incompressable, except for 1/27000 of its volume and wood fiber is compressable in some small degree, then an increase in pressure exerted on the fiber decreases the volume of air within the cellular structure of the fiber proportionally. Let us assume that we would like to operate at 100 p.s.i. According to Boyle's Law, new volume of enclosed air will be one-eighth of its original volume.

This reduction of air volume allows the fiber to collapse into oblong cross section rather than the round section. This collapsing provides for

1—increased area upon which the bar structure can work

2—ease of water penetration due to the high pressure

3—collapsing of the fiber fractures the inner cellular wall which still contains some hemicelluloses.

Under these conditions water exerts a plasticizing effect upon its cellulose structure so that it deforms more readily and flows during water removal (drying) into relatively stress-free positions. Emphasis has been shifted from external fibrillation only to partial emphasis on the internal fibrillation of the fiber, coupled with the breaking down of the fiber wall due to external beating and small portions of the cellulose being torn free and macerated to a point where it is suspended in the surrounding water.

This phenomena may contribute slightly to the early concepts of gelatinous material being formed on the surface of the fiber during beating cycles. The theory claiming physiochemical change in the fiber has been discounted by most of the experts in the paper chemistry field since it has been proven by many papers that the chemical structure of the fiber does not permit it to enter aqueous solution. However, photomicrograph studies reveal that gelatinous material exists about refined fibers and that this gel can be removed by merely adding hot water to the stock solution.

Pressure jordaning would tend to increase the absorption of water due to:

1—high pressure penetration

2—collapse of the cellular structure of the fiber

3—reduction of air volume entrapped in the fiber

4—explosion of the fiber when released to atmospheric pressure due to compressed air returning to normal volume.

I have not overlooked the possibility that the intimacy might change between the bar structure of the jordan when high pressure is exerted therein if the body of the jordan should breathe. However, this tendency would wear the bar structure in concave or convex pattern depending upon the pressure exerted. Our experience has been that examination of the fillings, following prolonged pressure runs, reveal no such wear pattern tendencies.

Unsubstantiated data, and I say unsubstantiated only because of the relatively few pressure jordaning installations in this country, reveals that a substantial power reduction is possible when the use of pressure jordaning is applied.

In several instances we have recorded power reductions in the order of 20 to 30 per cent by increasing the inlet pressure from atmospheric to 55 p.s.i. In other cases, substantial power reduction has been recorded where the pressure has been increased to 85/100 p.s.i.

It is realized that additional horsepower must be expended at the pump to induce the pressure but in actual cases, where high tonnage is realized, the total horsepower required was 30 per cent less.

Summation

It is my opinion that a refining engine should be used to develop maximum tear with good rise in mullen and tensile strength with minimum drop in freeness and no appreciable change in fiber length.

The modified refiner may be used for something under maximum tear development, good rise in mullen and tensile strength and reasonable fiber length reduction. An appreciable drop in freeness would also be realized.

The jordan should be used for mullen and tensile strength development control of density, formation, freeness or drainage rate on the wire and fiber length control. Porosity, although dependent upon fiber length, is not dependent upon refining or jordaning treatment in many cases. In these cases, it is considered to be a function of the machine-tender's judgment of spouting velocity at the slice versus wire speed.

Division of Power

Of primary importance in the design of any refining and jordaning system is the proper horsepower. In my limited reading, I was unable to find any reference made to this important factor in refining treatment.

To produce a given sheet where the final specifications are known requires careful scrutiny of the physical characteristics making up the specifications and how they are obtained. Table III indicates what is accomplished by the refiners and jordans. The refiner is contributory to drop in freeness, rise in mullen, rise in tensile and has negative effect on formation and printability. The jordan on the other hand, will give control of freeness, maximum rise in

TABLE III—WHAT REFINERS AND JORDANS DO

	Refiner	Jordan
Freeness	† Contributory, no sharp drop	√ Control, rapid drop
Mullen	† Some rise	√ Good improvement
Tensile	† Contributory	√ Follow Mullen
Tear	√ Max. development	Normally decreases
Shrinkage	Hi	† Lo
FLIT (Fiber Length Index)	Little reduction	√ Control
Formation	Negative	√ Control
Porosity	† Contributory	Under control machine tender
Smoothness	†	†
Printability	Negative	†
Cockle	√ Due to hydration	†

mullen and tensile and has negative effect on tear. It also controls the fiber length index, formation and is contributory to porosities, smoothness, printability.

In the initial stage of refining system planning, careful analysis should be made of the range of products and per cent of total production for each grade. Armed with this information it is then possible to design the system so that sufficient horsepower is applied in the refining stage and required balance in jordaning stage. This type of system would result in full utilization of the strengths of strong fibers and yet provide for the necessary control at the machine forming-section.

Table III may be used in simple mathematical form by using the control points or check marks as methods of division.

Let us take a top liner system as an example, see Table IV. Note that under top liner and folding grades, the refiner has check marks for maximum tear development, good shrinkage and retention of fiber length. The jordan has control of freeness and formation. It would then appear that three-fifths of the power should be devoted to refining and two-fifths to jordaning.

This is a simple method of using this information and one I have found useful in the many proven installations that I have helped plan.

The next step would be the actual division of the applied horsepower. What is the desired horsepower and where can this information be obtained is a question that has been asked many times, but I know of no suitable answer except experience and careful historical tabulation of existing systems.

The following information has been gathered over the past years and tabulated in a form that would assist in planning refining systems. It provides a yardstick gained from historical data and an objective concept which has its birth in the data obtained from many systems where varied effects have been realized.

TABLE IV—ANALYZING REFINING REQUIREMENTS FOR FOLDING BOARDS

		Refiner	Jordan
Top Liner			
	Freeness	†	√ Control
	Mullen	†	†
	Tensile	†	†
Require	Tear	√ Max	
	Shrinkage	√ Max	
	Flit	√ Max	
	Formation		√ Best
		3 (60%)	2 (40%)
Under Liner			
	Freeness	†	√ Control
	Mullen	†	†
	Tensile	†	†
Require	Tear	√ Max	
	Shrinkage	√	
	Flit	√ Max	
	Formation		√ Good
		3 (60%)	2 (40%)
Filler			
	Freeness	†	√
	Mullen	†	†
	Tensile	†	†
Require	Tear		
	Shrinkage		
	Flit		√
	Formation		√
			3 (100%)
Bottom Liner			
	Freeness	†	√
	Mullen	†	†
	Tensile	†	†
	Tear	†	
	Shrinkage		√
	Flit	√	
	Formation		√
		33%	67%

Liner Board

Twelve machines were surveyed producing approximately 8000 tons daily of 42 pound to 90 pound liner board. The average horsepower required for all stocks was 8.7 h.p. days per ton. The primary stock ranged from a low of 5.5 h.p. days per ton to 9.82 h.p. days per ton with an average of 7.85.

The secondary stock making up 14 to 20 per cent of the total sheet ranged from a low of 9.3 h.p. days per ton to a high of 24.4. The average being 15.0 h.p. days per ton. Many of the machines used primary systems for both stock followed by bleeding off and special treatment for the secondary stock.

For a new mill, we would recommend 5.5 h.p. days per ton for primary stock with a freeness of 600-650 and 14 h.p. days per ton for secondary stock with a freeness of 300-350. No consideration has been given to the pulp mill refining which varies from 3 to 5 h.p. days per ton in standard and high yield kraft systems.

Multiwall

Fifteen machines producing multiwall bag paper were surveyed having daily tonnage of 2700 tons and with machine production ranging from 50 tons per day to 300 tons per day. The average horsepower ranged from a low of 8.25 to 27.5 high. The overall average 15.5 h.p. days per ton. We learned that the low tonnage producers were not those with high horsepower demand systems. We found machines producing in excess of 200 tons per day usually demanding higher horsepower than the smaller machines. This may have been due to the fact that faster machine speeds require more refining in order to obtain comparable results.

A new mill being considered today for multiwall bag production and the other grades manufactured on the same machine should have approximately 15.5 h.p. per ton per day available and arranged so that 50 per cent is available for hydration and 50 per cent for cutting.

Kraft Lightweights

Five machines were surveyed having daily tonnage of 500 tons per day. The machines ranged from 40 tons to 200 tons daily production and the average power demand was 17.9 h.p. days per ton. It ranged from a low of 12.5 to

Unsubstantiated data, and I say unsubstantiated only because of the relatively few pressure jordaning installations in this country, reveals that a substantial power reduction is possible when the use of pressure jordaning is applied.

In the initial stage of refining system planning, careful analysis should be made of the range of products and percent of total production for each grade.

a high of 19.5. No consideration was given to geographical wood areas or pulp mill permanganate number.

A new machine being considered today should have approximately 16.0 h.p. days per ton available divided 50 per cent for refining and 50 per cent for jordaning.

Carrier Board

Five machines producing carrier board (a special grade of folding stock for soft drink carrying cartons) ranged in capacity from 85 to 200 tons per day with a total of 625 daily tons. Four machines had hydrating equipment; low 7.5 h.p. days per ton to a high of 18.4. The overall average was 18.17 h.p. days per ton. One machine had no refining equipment for hydration.

All five machines had jordan equipment for cutting; low of 7.5 to a high of 23.0. The overall average 15.85 h.p. days per ton.

The single machine without special hydrating equipment used well above average horsepower to prepare the stock for the paper machine. This may be due to the fact that they must over refine the stock in order to obtain the physical tests reached by the refining equipment.

Foodboard

Thirteen machines were surveyed, eight being fourdriniers producing more than 2000 tons daily. The average total horsepower was 11.9 h.p. days per ton. Seven of the eight machines used refining equipment for hydration and all eight machines used jordan equipment for cutting. The machine not using refining equipment was lowest in power demand. The seven using refining equipment ranged from a low of 2.6 to a high of 12.0. The overall average 6.4. For the jordans the horsepower ranged from a low of 2.3 to a high of 21.0 with an average of 6.45.

For a new fourdrinier installation, 9 h.p. should be available for summer refining and 8 h.p. for winter refining. Much depends upon the geographical location and the farther north that the mill is located the more important is the division of available horsepower. Water temperature has a great deal to do with type of physical characteristics retained by sheet during refining and it has been found that water temperature above 80° F. requires additional horsepower to give the same physical tests to the sheet.

Four cylinder machines were surveyed producing 400 tons per day with an average of 15.8 h.p. days per ton. The horsepower ranged from a low of 14.0 to a high of 17.5.

Three machines used refining equipment ranging from a low of 5.8 h.p. to a high of 8.75 with an average of 7.48. All machines used jordans ranging from a low of 6.7 to a high of 14.0 and overall average of 10.7. The one machine not having refining equipment used more than the average horsepower for jordans but was well below the average for refining totals.

For machines being installed today, 10 h.p. should be available for refining and 6 h.p. for jordaning—total of 16 h.p.

Twisting Tissue

Six machines were surveyed making daily tonnage of 60 for an average horsepower of 54.55. Each machine had refining equipment ranging from 16.6 low to 60.0 high, average 42.1 and jordaning equipment ranging from a low of 8.3 to a high of 40.0. Average being 19.45.

Cotton Linters

Three machines were surveyed producing 280 tons daily—average input 14.05 h.p. per ton per day ranging from 12.65 low to 16.5 high.

Saturating Papers

Three machines producing 320 tons per day for an average of 22.2 h.p. per ton per day ranging from 15.0 for low to 35.0 for a high.

Bond and Envelope

Three machines were surveyed with 320 tons daily production for 19.00 h.p. per ton per day. Each machine had refining and jordaning tackle, refining ranging from 2.36 low to 10 for high, average 6.1 and jordan equipment ranging from 5.9 to 17.5 high with an average of 11.0.

Cigarette

Eight cigarette machines were surveyed producing 120 tons daily. Approximately 35 h.p. was used for refining and average of 7.1 for jordaning for a total of 42.75. There was little change in individual machine refining systems.

One Time Carbon

Two machines producing 18.5 tons per day for an average input of 68.6 h.p. per ton per day. Refining from 47 to 58—average 53, jordaning 13.9 to 17.3—average 15.6.

Newsprint

One newsprint installation was surveyed recording two machines producing 800 tons. The only treatment being jordans 1.12 h.p. expended.

Boxboards

Nine boxboard machines were surveyed producing approximately 1100 tons daily. For top liner each of the machines had refining equipment ranging from a low of 3.3 to a high of 12.5 with an average of 7.42. The jordaning equipment ranged from 6.3 low to 26.5 high, average 12.9. The overall average 20.4.

Underliner:

Six of the nine machines had underliner systems. Only one of these had refining tackle 5.8 h.p. days per ton. All six machines had jordaning tackle ranging from 5.6 low to 12.0 high, average 8.71. The overall average 9.7.

Filler:

The filler system of one machine had 4.3 h.p. per ton per day on refining tackle, the balance all jordans. It ranged from a low of 3.15 to a high of 12.0 with overall average of 7.46. The overall average of all machines 7.95.

Bottom:

The bottom liner all nine machines had only jordan equipment ranging from a low of 3.7 to a high of 13.3 average 7.05.

For a new machine producing quality boxboards, we would recommend for top liner that 60 per cent of the power be available for refining, 40 per cent for jordaning or 7.2 h.p. per ton per day for refining and 6 h.p. for jordaning. Underliner approximately the same combination with 7 h.p. being available for refining and 6 h.p. for jordaning. Filler systems should have approximately 6 h.p. available, bottom liner systems approximately 3 h.p. for refining and 7 h.p. for jordaning.

Publication Papers

Eleven machines were surveyed producing 827 daily tons for an average horsepower of 24.5. All machines had refining equipment from a low of 3.06 to a high of 20.0, overall average 11.0. The jordans ranged from a low of 2.3 to a high of 23.3, overall average 13.35. A new publication paper machine should have approximately 10 h.p. available for refining and 6 h.p. for jordaning.

No. 28 in our extensive series on groundwood production . . .

Thickening Groundwood to High Densities

Dr. K. H. Klemm

Manager, München Dachauer Papier Fabriken
Munich, Germany

English text by
G. P. Chinn

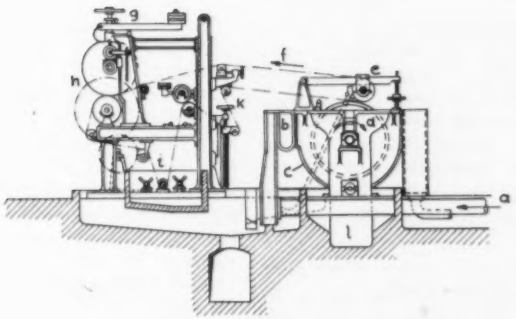


FIGURE 1—WORKING PRINCIPLE OF WET LAP MACHINE FOR DEWATERING GROUNDWOOD
a—Stock feed; b—Distribution box; c—Cylinder trough; d—De-watering cylinder; e—Couch roll; f—Pick-up felt; g—Press; h—Pick-up roll; i—Felt washer; k—Guide roll; l—White-water canal.

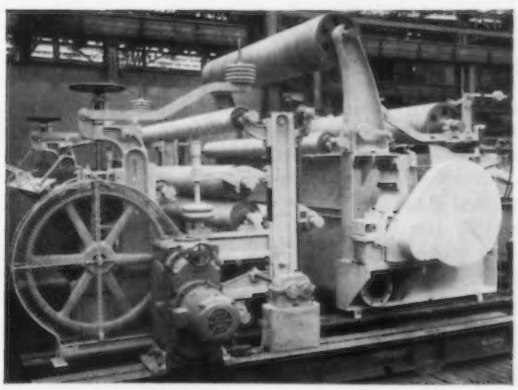


FIGURE 2—PHOTOGRAPH OF A VOITH WET LAP MACHINE

In mills making groundwood for sale or where storage is necessary, for weight reduction and ease of handling, the groundwood pulp must be thickened to considerably higher consistencies than are possible with thickeners and filters. In this case, wet lap machines are used or, more recently, especially in North America, screw presses have been introduced which deliver the groundwood in a form which can be transported through lines pneumatically.

Wet Lap Machines

Figure 1 shows the normal construction of a wet lap machine as built by various manufacturers. The operating principle is similar to that of the thickeners. The dilute pulp is fed at (**a**) and enters vat (**c**) from the headbox (**b**). A cylinder (**d**) revolves in this vat. Unlike the thickeners, the fiber layer is removed from the cylinder wire by a felt (**f**) which passes around the couch roll (**e**). The felt carries the wet web to a press (**g**) and finally to cylinder (**h**) where it builds up to be removed periodically. This last cylinder can also be replaced by a reel in which case the pulp is obtained in rolls. The felt is washed at (**i**) and its running is controlled with the guide rolls (**k**). While the felt and pressure applied at the presses help to increase the pulp consistency, the comparatively high consistencies in the range of 25 to 35 per cent can be reached only by using a low cylinder surface speed. With this, however, the capacity of the wet lap machine becomes very low. A wet lap machine with a cylinder 3.3 feet in diameter and 6.6 feet long, turning at four to six r.p.m., has a capacity of only 2.0-3.5 tons (o.d.)/day, equivalent to

0.05 tons (o.d.)/ft². when referred to the wire area. Two wet lap machines require one operator per shift. Labor costs, four to five man-hours per ton, are extremely high. Figure 2 shows the Voith wet lap machine. As wet lapping of groundwood is generally restricted to very small and a few medium sized mills, not too much attention has been given to the development of more efficient machines for this purpose. Recently, screw presses have received considerable attention whenever relatively larger amounts of stock must be handled.

Screw Presses

Because of the disadvantages, as mentioned above, of wet lap machines, early efforts were made to de-water groundwood with screw presses. Designs which fulfill all the requirements to reach consistencies of 25 per cent and higher have, however, become available only in recent years. Unfortunately, thickeners must be used ahead of the screw presses to bring the groundwood to a consistency of at least 3 per cent as this is the minimum consistency of the feed that can be handled. The advantages of screw presses are that the expensive processes of wet lapping and the transportation and storage of the lapped pulp are eliminated. Groundwood thickened with screw presses is in crumb form and can be handled pneumatically. The crumbs can be slushed at a consistency of eight to ten per cent in the standard pulpers.

As an example of the modern design of a screw press, the Zenith fiber press of E. D. Jones is shown in Figure 3. The consistencies of the feed stock which are necessary are:

Free groundwood (Freeness above 180 Can. Std.) 3%

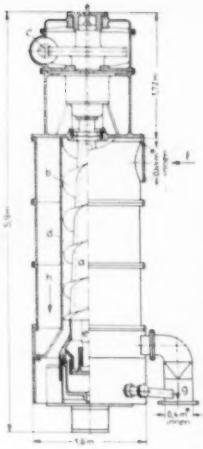
Medium groundwood (Freeness between 75-180 Can. Std.) 4.5%

Slow groundwood (Freeness below 75 Can. Std.) 6%

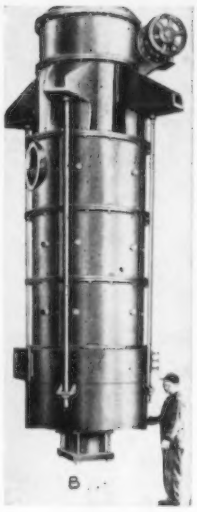
As can be seen from Figure 3A, the Zenith fiber press has a cone shaped vertical shaft (**a**) with spiral vanes (**b**). The shaft has a worm gear drive at the top. The shaft and vanes are enclosed in a cylindrical screen plate having very small perforations and constructed such that there is an annular channel through which the stock to be thickened flows. The stock flow is controlled by an air operated conical valve (**e**) at the bottom of this annular chamber. The feed stock must come through a headbox having a minimum head of 16 feet. The capacity of these presses depends upon:

1—The groundwood freeness
2—The consistency of the feed
3—The shaft speed

The latter must be chosen according to the consistency required at the stock outlet.



A



B

FIGURE 3—ZENITH FIBER PRESS (E. D. JONES)

A—Working principle.
B——Photograph of Zenith Fiber Press.
a — Vertical conical shaft; b — Spiral vane for moving stock through press; c—Drive through a worm gear; d—Perforated cylindrical screen plate; e—Air loaded pressure regulating valve; f—Stock feed; g—Stock outlet; h—Cylindrical chamber for extracted water.

The operating principle is based on the construction of the vanes which provide a slower stock traveling rate as the bottom of the press is approached and by the conical nature of the flow channel. This increases the pressure on the pulp as more and more water passes through the screen holes and is removed from the press through the channel (**h**) at the periphery. The pressure built up inside the screen plate is controlled by the air loaded conical outlet valve. This system assures a constant consistency of the thickened stock. The Zenith fiber press which can be obtained in a number of sizes having capacities between 10 and 100 tons of groundwood per day, is shown in Figure 3 B.

As an operating example, a Zenith fiber press in a West Coast North American mill thickens 20 to 25 tons per day of groundwood, at a freeness of 90 Can. Std. and a feed consistency of four to five per cent, to a consistency of 38 to 42 per cent. It is driven by a 30 h.p. motor at a shaft speed of 6 r.p.m. Outside of routine oiling, no men are required for its operation. The handling of the groundwood crumbs, including loading of trucks, is fully automatic. This is done by an automatically controlled blower system requiring a 35 h.p. drive motor.

It can be expected that this method of groundwood thickening will become more important in the future.

Everybody Reads Trends . . .

Dear Mr. Evans:

In your Trends column of the February 24th issue you say that in The Reader's Digest ". . . advertising space for the first quarter is being considerably reduced." I think you'll be interested in the clipping attached, from the Wall Street Journal of February 20. It goes part way in correcting an impression about Reader's Digest that a previous article in the same newspaper may have created. Because I thought you would like the full story, I have enclosed it also, in the form of our page figures and dollar volume for the four issues of 1958 that have already closed for advertising.

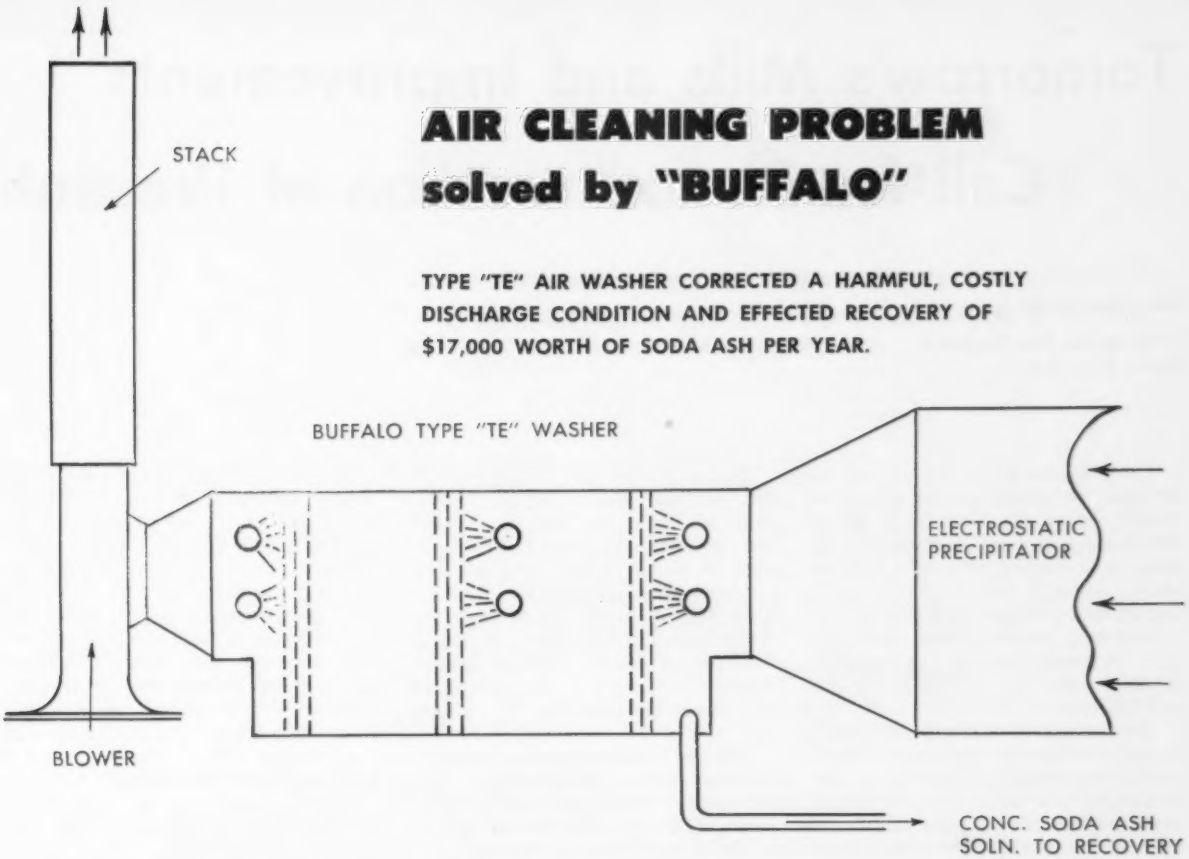
The fact is that Reader's Digest is having the best first quarter since it started carrying advertising. And, we are glad to add, our goals are becoming somewhat tougher—for 1957 itself was 52% ahead of the year before. This means we're using more tons of paper than we've ever used before (the print order on the March '58 issue was 13,871,474) and we intend to continue to increase.

Sincerely,
Lynn C. Mapes
Assistant Production Manager
The Reader's Digest

Editor's Note—But they were off 10% in February.

AIR CLEANING PROBLEM solved by "BUFFALO"

TYPE "TE" AIR WASHER CORRECTED A HARMFUL, COSTLY DISCHARGE CONDITION AND EFFECTED RECOVERY OF $17,000 WORTH OF SODA ASH PER YEAR.



PROBLEM

A paper firm was suffering poor community relations due to a soda ash discharge from its recovery plant. The ash, flaking off the collecting plates of its large electro-static precipitator, was damaging auto finishes.

SOLUTION

Installation of a "Buffalo" 84,000 cfm Type "TE" Washer as shown. Washer is all-stainless construction, with two wet scrubbing stages and one eliminator stage. Scrubbing water was recirculated thru spray nozzles at 20 psi until soda ash became concentrated enough for efficient collection.

RESULTS

Nuisance to neighbors was eliminated. Inlet soda ash loadings ranging from .13 to .43 grains/cu. ft. were reduced to between .02 and .09 grains at outlet for a collection efficiency average of 88.2%. 500 tons of soda ash are recovered each year in continuous service between annual maintenance shutdowns.

WHAT'S YOUR AIR CLEANING PROBLEM?

Whatever the contaminant, whatever the removal problem, chances are excellent that a "Buffalo" Unit is controlling a similar condition in your industry to complete satisfaction. Write for details today—take advantage of our long experience in industrial air cleaning.

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VENTILATING	AIR CLEANING	AIR TEMPERING
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Sales Representatives in all Principal Cities

Tomorrow's Mills and Improvements Call for Re-examination of Present

Lee Eberhardt

Asst. to the Vice President
Bauer Bros. Co.

The pulp and paper industry and individual companies in it are at a crossroads. Today the situation is one in which one must work to stand still, and progress to survive. The short term situation is strictly one of economics, for the current problems are those of high capital cost, over-expansion, soft markets, increasing costs of raw materials, labor, freight, and overhead; all economic factors.

The problem is very graphically illustrated at present by the year-end financial statements being issued by the pulp and paper companies. With few exceptions the theme is the same; sales equal or better than 1956, net profit off 10, 15, to 25 per cent. Reasons: Soft markets, cutbacks in production tonnage, and higher labor, freight and raw material costs. These financial statements are not a reflection on top management, policy or operating efficiency; but are due to economic factors over which management has little or no control.

Capital Costs Too High

New projects are at the highest cost per daily ton of capacity in history and must be paid for in a situation where the government takes 50 per cent in taxes out of a successful company's profits.

For example, at the present time it costs approximately $120,000 per daily ton capacity to build a modern integrated newsprint mill. A 600-ton unit will require $72,000,000 capital investment, which in turn will take 15.2 years to pay off assuming a profit of $45 per ton before taxes and 350-day operation per year. It also takes 2.64 years to return the capital as gross sales.

This is not the end of the road, in that the mill would require 250,000 cords of wood per year or 250,000 acres of timberland based on a sustained yield increment of one cord per acre per year. It is questionable if such a large block of timber can be assembled in the United States today. In case of some recent southern timber acquisitions at $100 per acre the timberlands cost equals one-third that of the pulp mill.

Risk or venture capital naturally gravitates toward projects which offer the greatest return on capital investment. The 15 years payout on the newsprint mill is one of the major reasons why few new plants of this type have been built in recent years. Even an optimistic banker will clip bond coupons with little or no risk rather than invest in such long-term payout projects.

In view of the above situation we at Bauer Bros. believe that overall capital requirements to build mills must be reduced. The pulp mill picture from tree to endproduct must be critically examined, and new ideas, processes, and techniques developed in order to reduce this basic problem of capital requirement.

A partial answer is higher capacity equipment. For example, in ten years the Bauer double disk refiner has increased from 300 to 800 h.p. per machine and the cost per installed horsepower is less today than in 1948. In large refining installations fewer machines are required with reduction in building requirements and labor. The trend is toward bigger, better, maintenance-free automated equipment.

It appears that the logical solution to the pulpwood handling problem is to convert logs into chips as early in the process as possible.

The paper industry takes great pride in its technological advances and rightly so. I believe it is no exaggeration to state that in the past five years we have progressed as far as in the previous 20 years. But is it enough? After all the basic groundwood, sulphite, and kraft processes are in the neighborhood of 100 years old. The progress attained has been by improvement of existing processes and techniques, and not fundamental changes.

Look at Kraft Bleaching!

This type of progress has had a drastic effect upon capital requirement in that the processes tend to become more complex. A good example is the achievement of 90 plus brightness in bleached kraft pulp mills where this has been accomplished by adding more and more bleaching stages until 8 and 9-stage plants are being utilized. Each additional stage requires approximately $500,000 investment capital. From the standpoint of capital investment simplification would appear to be in order.

In this same bleached kraft mill what do we do? We take a soft wood which has a brightness in the stick of 50-55 per cent G. E. brightness, we cook it to less than 50 per cent yield and a brightness in the low 30s. Then after processing through three or four stages in the bleach plant, we finally are back where we started and then require the additional stages to achieve the desired 90 plus brightness at final yield of less than 40 per cent based on wood.

Fundamentally, it appears the process is aimed at purification of cellulose and only incidentally at producing a white fibrous material adequate for endproduct quality in the paper machine reel. It would also appear that the entire situation is suspect and drastic simplification accompanied by lowering of capital investment is required.

In this Sputnik age, Breakthrough is a common household word. Aren't we overdue for more "Breakthrough" in the pulp and paper field? Witness the

Methods and Their High Capital Costs

The author briefly appraises our operations from tree to finished paper and calls for a fresh look at all our processes.

and plastics. Whole new industries that have risen in the past 25 years to compete with this industry in production, product development, pricing, sales and sales promotion. A visit to your local supermarket provides a graphic example of the fierce competition between glass, plastics, aluminum, and paper products for packaging.

Wood Costs

Wood is the basic raw material of the pulp and paper industry and one of the major economic factors in endproduct costs. At the present time the price level for peeled softwood pulpwood on the block pile varies widely in the geographic pulp producing regions. Approximate relative per unit figures are as follows: $18 in the South, $22 Pacific Northwest; $35 Lake States, and $45 to $55 for the Northeast and Eastern Canada. In most cases hardwoods are somewhat lower in cost.

The above costs depend primarily upon factors of accessibility, labor, transportation and stumpage costs, yield per acre and annual growth increment. Of these factors all but the last two are due to demand, economic and political aspects. The last two factors are dependent upon forest genetics and forest management, both fields that are in relative primitive state of development.

There is a most interesting operation in the Pacific Northwest on lodgepole pine growing on mountainous terrain. A scissors equipped bulldozer cuts a swath through the stand. The stems, 10 to 15 at a time, are fairleaded into a modified logging arch and a bulldozer drags them to the landing.

At the landing, the whole trees are fed butt first into a horizontal feed chipper which in turn loads to a 2800-cubic-foot trailer, three of which are shuttled by over-the-road tractors 75 to 90 miles to the pulp mill. At the mill the trailers are upend dumped and the chips handled into the mill or chip pile. The bark is removed in the screening operation. This "Blood, Guts and Feathers" technique run by independent operators delivers the chips at a total cost of less than $15 per unit. This is the lowest cost production from timberlands we have ever encountered.

The chainsaw was an important breakthrough in the woods; perhaps the idea above provides the nucleus of another.

Wood Handling

A stick of pulpwood is about as miserable an item to handle as you will ever encounter. Hand labor, machine labor and capital are expended freely all the way from the tree to the chipper. It appears that the logical solution to the pulpwood handling problem is to convert it into chips as early in the process as possible.

Petroleum products are being piped from Alberta to Montreal, and Texas to New England. In Ohio they are pumping coal from southern Ohio to Cleveland; could not similar methods be utilized on finely divided wood in a fluid medium of water or air?

Chips are being stored in outdoor piles in most of the West Coast mills, and their chip handling systems as installed are very practical, inexpensive and efficient. Many of these same ideas can be applied to eastern and Northern conditions.

Someone will probably say, "Well, what do you do under severe snow and cold climatic conditions?" We know chips in a pile will not freeze down more than a few inches due to their insulating nature, and if it is feasible to put a plastic impregnated nylon cover over football fields, could not the same technique be applied to piles of chips under northern conditions?

Pulping Methods

The continuous digester is rapidly becoming an accepted instrument in pulp mill operations. We believe that a fully automated continuous pulping process for all pulp grades is very near. New techniques, higher pressures, better impregnation, better corrosion resistance, lower maintenance charges, and greater versatility, control and uniformity of endproduct quality are in the offing. These developments will provide a substantial labor saving per ton of endproduct, and offer the possibility of decreased capital requirement.

Press washing is rapidly developing and has appeal as offering the possibility of lower capital investment and better chance of automation than the low density systems. Greater capacity per unit, better efficiency and better mechanical performance problems are being solved quite rapidly. The new Bauer Pressafiner, and allied equipment being developed are providing excellent results.

Refining is becoming more of a factor in the pulp mill as there is a trend

In a recent survey of over 850 bleaching patents it was found that over 90 per cent started out as a new method for the purification or "refining" of cellulose and practically none of the patents were on whitening of cellulosic or cellulose-lignin fibrous materials for use on the paper machine.

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toward higher yields in the conventional processes, and the necessity of more power application in semichemical, cold soda pulping, and the groundwood from chips concept.

Screening and pulp cleaning with Bauer cleaners and screen combinations have obsoleted flat screens and greatly reduced wood room operations. The cleaners have also provided a means of removal of bark and shive dirt, heretofore not possible to obtain.

The combination of the above types of equipment makes possible the fully automated, readily expandable, low capital cost pulp mill. Using this equipment it is also possible to consider moving the pulp mill to the wood source, for partial conversion of the wood raw material.

In this case the new Bauer System for pulp fluff-drying and baling could be used for preparing it for the paper mill located centrally at the rail head or tide water. This is the so-called bush pulp mill concept. Complete automation is entirely practical and it is possible for a minimum crew to operate the entire system from a panel board and convert chips into a clean screened unbleached endproduct in high tonnage quantities.

Pulp Bleaching

As indicated previously, bleaching techniques appear to be dedicated to purification or "refining" of cellulose. In a recent survey of over 850 bleaching patents it was found that over 90 per cent started out as a new method for the purification or "refining" of cellulose and practically none of the patents were on whitening of cellulosic or cellulose-lignin fibrous materials for use on the paper machine.

Some of the industry's literature defines lignin as a white fibrous material associated with cellulose in plant cellular structure. In other words, lignin—the stuff we go to great lengths to remove in pulping and bleaching processes—has possibly the same character of being white and fibrous as the material we want in the endproduct roll of paper.

It is commercially proven that some cold caustic pulps can be bleached to the 75 to 80 G. E. brightness range in a simple two-stage system at 80 plus per cent yield based on wood, at a total cost per ton of 50 to 60 dollars. In this situation it is obvious that we must be dealing with this white fibrous material lignin, since the relatively mild treatment did little in the way of lignin removal, and/or cellulose purification.

The economics of production of this type pulp are excellent if it meets with endproduct quality requirements. A company's grade structure might be analyzed to see how pulps of this type could be fitted in as a major or supplemental portion of paper machine furnishes.

Conventional bleaching systems use low density and relatively low temperature methods. There are some indications that new bleaching agents, higher densities and temperatures of reaction offer possibilities of lower capital cost, better endproduct quality, higher yields and process simplification.

Developments in Papermaking

Paper machine operations are out of the range of the writer's background. The modern trend, however, appears to be that of bigger, faster, wider machines, running 24 hours per day. This is the modern concept of paper machine operations for the reduction of machine converting costs.

Traditionally the paper process is tied to water. Fresh cut wood contains 50 per cent moisture and throughout the conversion of wood to paper tremendous volumes of water are handled. Most of the time at very high water to wood ratios. Water is used for pulp washing; following washing we must evaporate the dilute chemical solutions for burning. Bleaching, screening and cleaning are at low consistency and must be followed by thickening to reduce physical volume. On the paper machine itself we take a very dilute mixture of fiber and water and produce paper by means of draining, vacuum and evaporation. This traditional handling is very expensive, creates extreme pollution problems and other maintenance, labor and cost situations. Should not other means of handling be investigated for possibilities of handling wood chips, pulp and paper at higher densities and less physical volume?

There are some ideas of forming the paper web with dry fiber utilizing resin bonding or electrostatic layering of fiber. This and other ideas may have an impact on the future.

Another interesting development is the Beloit - Crown Zellerbach "Little Machine." This is a small, efficient paper machine that can be readily located at the market rather than the raw material source. It is interesting to speculate on the possibilities of tying such a machine into the bush pulp mill concept.

Here again the economic factor of freight cost enters the picture and the pulp and paper industry is traditionally a freight allowed business. With the current inflationary trends, indications are that freight rates can only go up. If this is the case, the very large paper mill remotely located from the potential market has a definite present handicap that will become more severe in the future.

Conclusions

The pulp and paper industry is in an evolutionary and revolutionary transition at the present time. Progress has been rapid but it appears the time is ripe for fundamental changes in process, machines and ideas for meeting today's severe economic conditions and demands.

It is necessary that maximum efficiency in the production and utilization of fiber be attained from timber holding through to the endproduct to meet tomorrow's fiber demands.

This efficiency can be attained by mechanization, automation, new machines and processes utilizing all available wood species at high yield levels. We have some of the answers and others will be forthcoming.

Semichemical, cold caustic pulping, groundwood from chips, utilization of hardwoods, residues and cull species, high density bleaching, higher yields are all realities and will contribute to the requirement of lower capital and production costs in spite of the long term inflationary trend.

The 15 years payout on the newsprint mill is one of the major reasons why few new plants of this type have been built in recent years.

THE POLICY

to give Rayonier wood pulp customers an edge on their competition

"Today, Rayonier is a major supplier of wood pulp to the paper industry. Rayonier will remain a major supplier, tomorrow and in the years ahead."

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2. Three Major Production Areas: the Southeast for our top grade sulfate pulps—both softwoods and hardwoods; the Pacific Northwest and British Columbia for our quality sulfites. Diversification and versatility assure matchless product and delivery reliability . . . plus the flexibility to meet your changing needs.

3. Direct Sales. Our sales policy for bleached wood pulps is direct manufacturer contact with our customers. Our own sales force calls on you. Have you met your Rayonier Sales Representative? He's got a digester-full of profit opportunities for you.

4. Research and Technical Services. Every product is heavily supported with on-the-spot-technical services—and at a moment's notice! This service is further backed by our three advanced research divisions in the U.S.A. and Canada . . . additional assurance that quality performance and all other benefits are yours from Rayonier wood pulps.

5. A Basic Raw Material Supplier. Rayonier's complete line of wood pulps is supplemented by the most complete line of chemical cellulose in the industry. Above all, Rayonier is first a supplier of basic raw materials.

Let Rayonier's unique wood pulp policy and position in the industry serve you and your needs by giving you *many* an edge on your competition.

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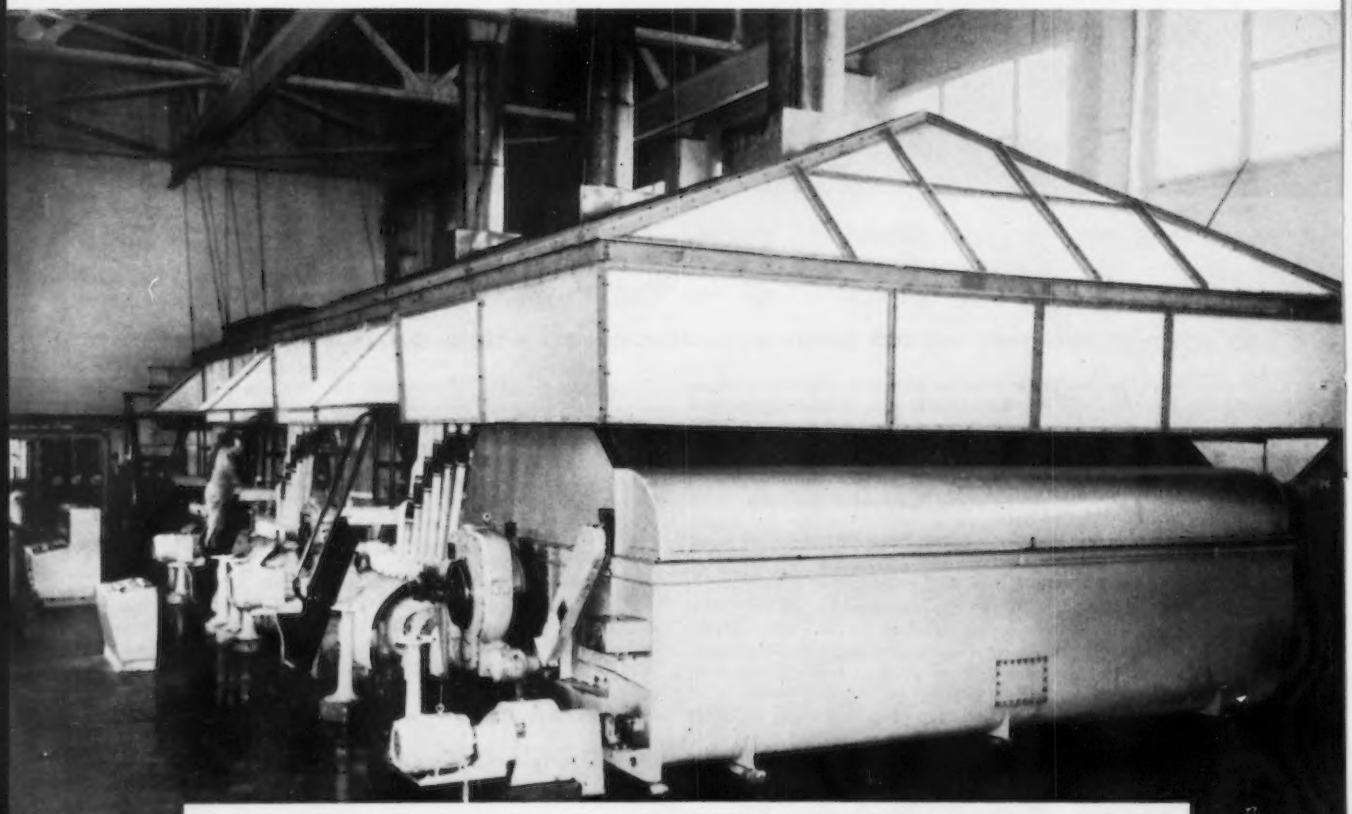
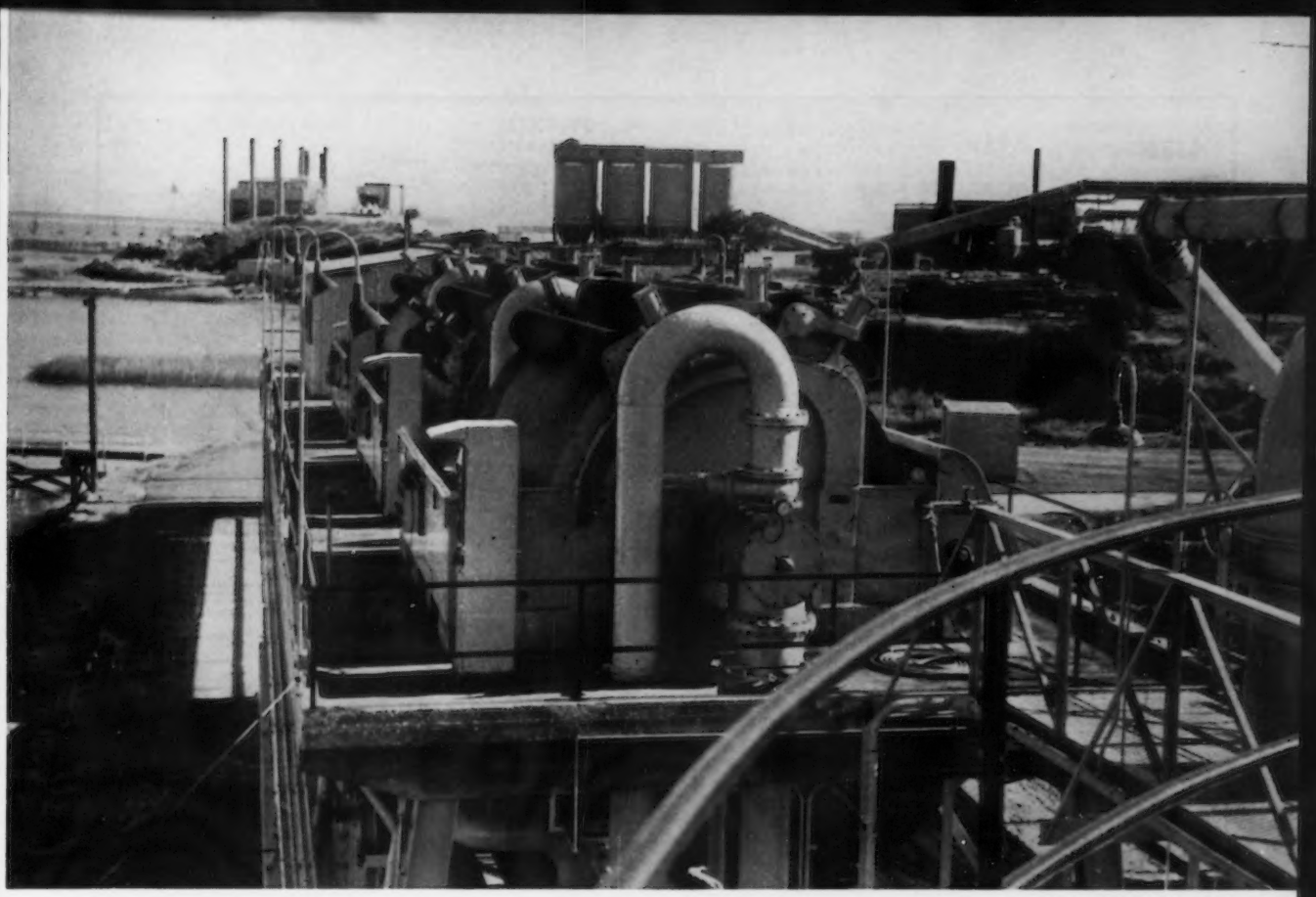
From Duncan Bay, British Columbia to Antioch, California, the significance of Dorr-Oliver's contribution to "Operation Noodle Pulp" lies in diversification and performance.

At the Elk Falls Company Limited on Vancouver Island, a Dorr-Oliver Brownstock Washing System processes pulp from Canadian forests. From the Elk Falls Co. Ltd. at Duncan Bay, B.C. the pulp is shipped via a special tanker to Antioch, Calif., where D-O Thickeners, Valveless Deckers, Ahlfors Screens, an Oliver Saveall, and a Clariflocculator have been installed in Crown Zellerbach's new 400 TPD facilities.

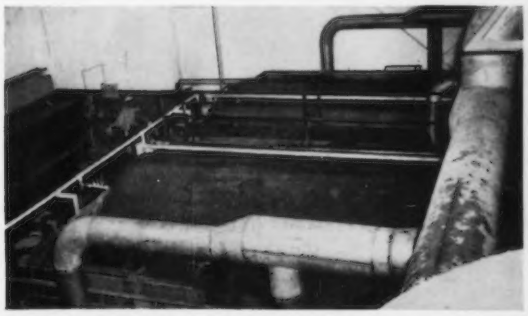
For more information on the complete line of Dorr-Oliver equipment and services for the pulp and paper industry write Dorr-Oliver Incorporated, Stamford, Connecticut.



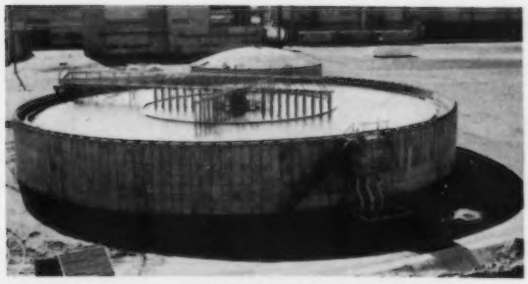
D-O BROWNSTOCK WASHING SYSTEM AT ELK FALLS COMPANY LIMITED ON VANCOUVER ISLAND . . . is equipped with three 11'6" x 20' Oliver Brownstock Washers for three stage washing system. A Dorr-Oliver Shredder (not shown), also installed at the Duncan Bay site, shreds the pulp for shipment to Antioch, California via CZ's specially constructed tanker, the S.S. Duncan Bay.



OLIVER HIGH-DENSITY THICKENERS ON THE DOCK AT ANTIOCH, CALIFORNIA . . . thicken the diluted stock pumped from the S. S. Duncan Bay to 25% consistency. Stock from these big (11'6" x 16') Thickeners is then carried to storage areas by conveyor belt and a large stacker.

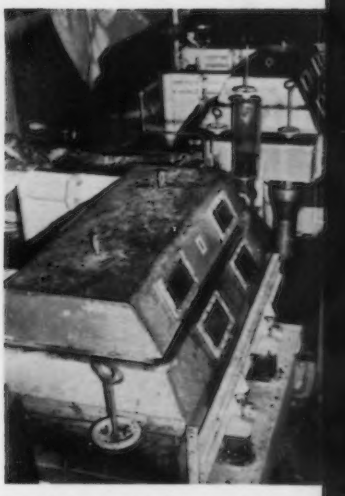


OLIVER DECKERS IN FIRST PROCESSING STEP INSIDE MILL . . . after screening stock is thickened on two Oliver 9'6" face x 16' valveless Deckers. A 24" D-O repulper conveyor is installed between the two Deckers.



DORR 120' DIA. CLARIFLOCCULATOR PROCESSES 10 MGD OF SAN JOAQUIN RIVER WATER . . . for pulp handling purposes. Chemical additives to facilitate treatment are alum and silicate.

DORR-OLIVER SAVEALL RECLAIMS FIBRES FROM PAPER MACHINE WHITE WATER . . . this 8' x 16' Oliver Vacuum Saveall, with a rubber-covered cylinder, is installed at wet end of West's second largest machine.



D-O AHLFORS SCREENS PROCESS RE FINED SCREENINGS . . . these Upflow V brating Pulp Screens, 24 sq. ft. models, ar used as part of a rescreening from primar screens.

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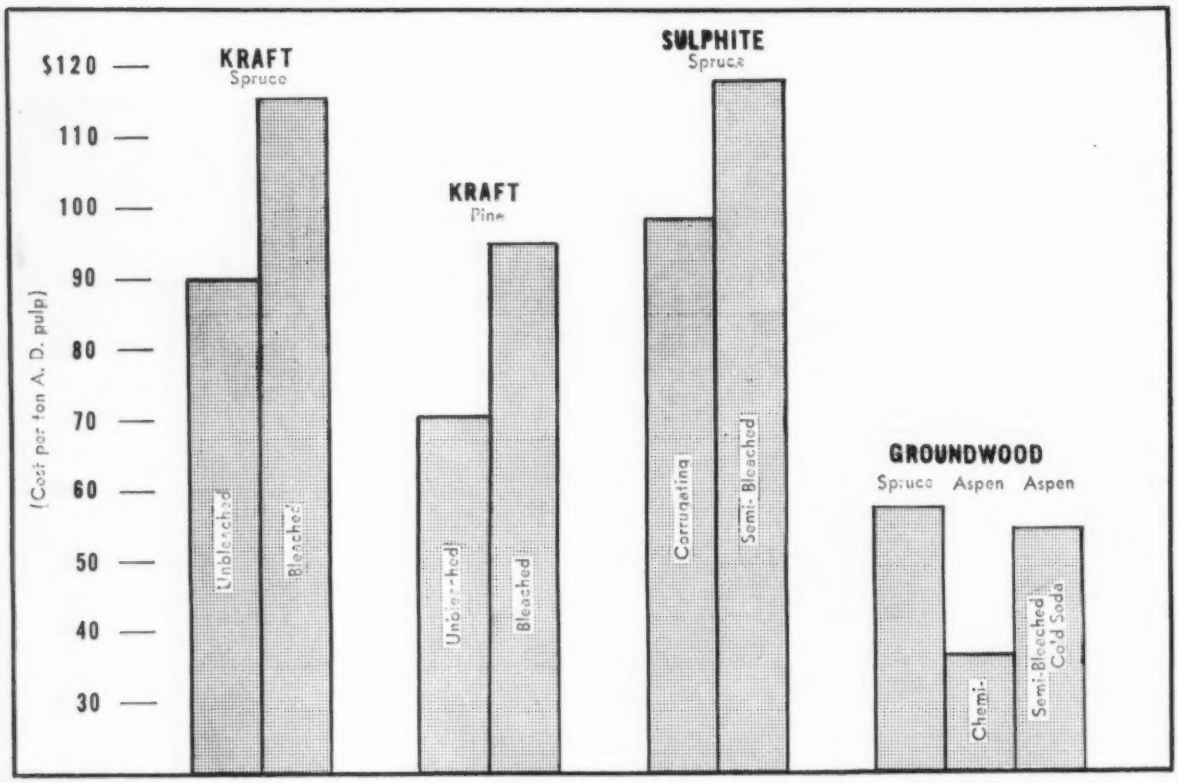

Economics of the Various Pulping Processes

R. A. Diehm

Professor of Paper Technology
Western Michigan University
Kalamazoo, Mich.

In dealing with the general topic of the economics of pulp manufacture, it becomes necessary to make many compromises to arrive at figures which might serve as a useful basis for discussion. While this will not develop the actual production costs, it will put the various processes over the same common denominator so that direct comparisons between them can be made. It seems that with the application of production factors of specific mills to these figures one will come very close to showing the actual manufacturing costs.

The suitability of the various pulps for specific purposes is disregarded in this analysis. All the pulps considered here are being made on a commercial scale and are used satisfactorily in paper or paperboard production, and are indicative of the modern trend in pulp manufacture.

The costs considered here are designed to apply particularly to the production of pulps in the Middle Western states. In making this limitation, it was possible to use some costs that apply directly to operations in this section of the United States, while some other costs may apply almost everywhere in this country.

Frequent reference is made to the report of the Food and Agriculture Organization of the United Nations which considered the economics and feasibility of making pulps from various raw materials. This information was released in Rome in 1953. Considerable data for this analysis are drawn from the F.A.O. Report.

Investment and Labor

The investment costs are estimated for production units ranging from 50 to 100 tons of pulp per day. The figures given on a tonnage basis are too low for a smaller production unit and too high for a large production unit. A very difficult matter in this respect is the evaluation of the human productivity which varies with the extent of automation which, in turn, is determined largely by the capital investment. Estimates were made on the basis of average automation found in the industry. In all probability, this required the greatest compromises of all.

Labor costs were determined according to the wage contracts set up by the Lake States mills during the 1957 sum-

mer contract negotiations. The average hourly wage for men is $1.81 and for maintenance workers is $2.37.

Steam, Power and Wood

On operating costs, electric power was charged at the rate of 0.8 cents per kw.-hr., steam at 60 cents per 1000 pounds and water at a pumping cost of 0.5 cents per 1000 gallons. It was assumed that natural water available to the mill was of good enough quality to use in pulp manufacture. If this is not the case for any specific mill, it will be necessary to add water treatment costs to the above pumping costs.

The wood costs are open market quotations released in Wisconsin and Michigan during November 1957. The costs, as given, are for peeled and washed wood, including a one dollar per cord wood handling charge. Freight charges as well as chipping costs and material losses in chipping must be added to the cost of the wood given in the analysis. The costs used per cord are as follows: spruce $34.50; pine $23.00; and aspen $20.50.

Chemical Costs

The costs of the various chemicals used in pulp manufacture are those published in the *Chemical and Engineering News* in November 1957.

The following prices were used:

Sodium hydroxide	$3.50	per cwt.
Salt cake	2.20	" "
Limestone	.20	" "
Hydrated lime	.60	" "
Chlorine	4.00	" "
Sulphur	1.50	" "
Salt	1.00	" "
Soda ash	1.60	" "
Sodium silicate	1.30	" "
Calcium oxide	.90	" "

Repair and maintenance costs, supervision, overhead and depreciation are reported at ten per cent above those worked out so carefully in the 1953 report.

Wood

The consumption of wood pulp manufacture was 24.5 million cords in 1952 and it is estimated that the 1975 consumption will be 47.5 million cords, 7.9 million cords of which will come from wood waste. Only a few years ago 90 per cent of the pulpwood used came from coniferous trees. It is too much to expect that United States production of pulp can keep on increasing and increasing without either depleting the coniferous sources or making it necessary to harvest wood from the marginal areas.

This wood picture made the pulp technician look for other fiber sources in a long range program, and it was not surprising that the hardwoods were considered because the American papermaker has always enjoyed better success with fibers from wood than with fibers from annual crops and other grasses. Furthermore, there is a lot of hardwood near the large paper markets.

Another possibility in conserving the fiber sources was in making pulps in higher yield from various woods. Here the hardwoods were superior because the high lignin content of the coniferous woods was a limiting factor in obtaining high yield pulps. The high yield pulps made from hardwoods are here to stay because of wood supply, economics of the processes and the ability of the pulps to adapt themselves to many papermaking problems.

High yield pulps are sometimes called "semichemical" pulps, and very often "neutral sulphite" is used synonymously with "semichemical" pulp. Since various processes adapt themselves to the manufacture of both low yield and high yield pulps, every process handled so that the yield is over 60 per cent shall be considered high yield in this analysis. The development of the disk refiner played an important role in making high yield pulp manufacture possible.

All the calculations are given for slush pulps on an A. D. ton basis. From $10.75 to $13.50 per ton must be added to sheet and to dry these pulps to 90 per cent air dry fiber. These figures include steam, labor, depreciation and overhead.

Yield Basis

The costs of unbleached and bleached kraft pulps from spruce, pine and aspen are shown in Table I. The yields of the coniferous unbleached pulps were taken at 48 per cent and those of the bleached coniferous pulps at 43 per cent. In the hardwood, the unbleached and bleached yields were 52 and 48 per cent respectively. In Table II are shown the costs of spruce sulphite with an unbleached

TABLE I—KRAFT PULPS

(Cost per ton A. D. pulp)

Type of Pulp	Unbleached			Bleached		
Type of Wood	Spruce	Pine	Aspen	Spruce	Pine	Aspen
Wood	55.35	36.90	21.78	63.99	42.75	23.85
Caustic Soad	—	—	—	1.89	1.89	1.89
Salt Cake	3.56	3.56	3.17	3.96	3.96	3.56
Limestone	.11	.11	.10	.12	.12	.11
Hydrated Lime	—	—	—	.32	.32	.22
Chlorine	—	—	—	5.76	5.76	4.32
Electricity	2.61	2.61	2.12	3.28	3.28	2.81
Water	1.19	1.19	1.19	2.97	2.97	2.97
Steam	.14	.14	.11	1.61	1.61	1.46
Operating Labor	7.34	7.34	7.34	8.79	8.79	8.79
Repair Labor	1.92	1.92	1.92	2.99	2.99	1.92
Repair Materials	2.41	2.41	2.41	3.11	3.11	3.11
Supervision & Overhead	3.11	3.11	3.11	4.09	4.09	4.09
Depreciation—Plant & Equip.	10.35	10.35	10.35	11.70	11.70	11.70
Miscellaneous	1.35	1.35	1.35	1.80	1.80	1.80
Total Cost—Slush Pulp	89.44	70.99	54.95	116.38	95.14	72.60

TABLE II—SULPHITE AND NEUTRAL SULPHITE PULPS

(Cost per ton A. D. pulp)

Process	Spruce-Sulphite		Aspen Neutral Corrugating Grade	Sulphite Semi-Bleached
Type of Pulp	Unbleached	Bleached		
Wood	61.02	65.70	19.89	24.98
Caustic Soad	—	.63	—	1.32
Limestone	.54	.59	—	—
Hydrated Lime	—	.43	—	.43
Chlorine	—	4.32	—	4.32
Sulphur	3.26	3.51	.76	.76
Soda Ash	—	—	3.91	6.64
Electricity	1.94	2.41	2.28	2.81
Water	2.38	4.77	.95	2.12
Steam	2.92	3.40	1.95	3.24
Operating Labor	7.34	8.46	4.41	5.89
Repair Labor	1.92	2.99	.93	1.93
Repair Materials	2.41	3.28	1.63	2.41
Supervision & Overhead	3.28	4.09	2.04	2.45
Depreciation—Plant & Equip.	10.35	11.70	6.30	8.10
Miscellaneous	1.35	1.80	.90	1.13
Total Cost—Slush Pulp	98.72	118.08	45.95	68.53

TABLE III—GROUNDWOOD PULPS

(Cost per ton A. D. Pulp)

	Groundwood-Spruce	Groundwood-Aspen	Aspen Chemi-Groundwood
Wood	37.26	14.76	18.45
Sulphur	—	—	.58
Soda Ash	—	—	2.16
Electricity	5.76	7.20	6.62
Water	.46	.46	.36
Steam	—	—	.65
Operating Labor	3.26	3.26	3.54
Repair Labor	.61	.61	.61
Repair Materials	2.45	2.45	2.45
Supervision & Overhead	1.22	1.22	1.35
Depreciation—Plant & Equip.	4.95	4.95	4.95
Miscellaneous	1.35	1.35	1.35
Total Cost—Slush Pulp	57.32	36.26	43.07

TABLE IV—ASPEN COLD SODA, STRAW AND BAGASSE PULPS

(Cost per ton A. D. pulp)

	Semibleached Aspen Cold Soda	Straw-Lime	Bagasse-Soda
Raw Material	16.61	16.92	15.30
Sodium Hydroxide	6.26	—	13.59
Hydrated Lime	1.07	1.24	—
Chlorine	6.44	—	—
Sodium Silicate	.47	—	—
Electricity	3.92	.79	2.64
Water	.94	.27	.90
Steam	—	.89	2.16
Operating Labor	5.92	8.87	6.52
Repair Labor	1.93	1.07	1.93
Repair Materials	1.63	1.22	1.63
Supervision & Overhead	1.63	3.27	1.63
Depreciation—Plant & Equip.	6.30	6.30	6.30
Miscellaneous	1.35	.90	.90
Total Cost—Slush Pulp	54.47	41.74	53.50

TABLE V—COST SUMMARY

Raw Material	Process	Wood Cost	Chemical Costs	Fixed Charges & Quality Cost	Total Cost
Spruce	Unbleached Kraft	55.35	3.67	30.42	89.44
	Bleached Kraft	63.99	12.05	40.34	116.38
Pine	Unbleached Kraft	36.90	3.67	30.42	70.99
	Bleached Kraft	42.75	12.05	40.34	95.14
Aspen	Unbleached Kraft	21.78	3.27	29.90	54.95
	Bleached Kraft	23.85	10.10	38.65	72.60
Spruce	Unbleached Sulphite	61.02	3.80	33.90	98.72
	Bleached Sulphite	65.70	9.48	42.90	118.08
Aspen	NSSC—Corrugating	19.89	4.67	21.39	45.95
	NSSC Semi-bleached	24.98	13.47	30.08	68.53
Aspen	Cold Soda Semi-bleached	16.61	14.24	23.62	54.47
Aspen	Groundwood	14.76	—	21.50	36.26
Spruce	Groundwood	37.26	—	20.06	57.32
Aspen	Chemi-groundwood	18.45	2.74	21.88	43.07
Straw	Lime—Corrugating	16.92	1.24	23.58	41.74
Bagasse	Soda—board grade (55% yield)	15.30	13.59	24.61	53.50

yield of 46 per cent and a bleached yield of 42 per cent, aspen neutral sulphite semichemical corrugating grade pulp at 75 per cent yield, and aspen semibleached printing paper pulp at 60 per cent yield. Spruce and aspen groundwood at 95 per cent yields and aspen chemigroundwood at 83 per cent yield production costs are shown in Table III. The costs for semibleached aspen cold soda at 88 per cent yield, straw pulp at 75 per cent yield, and bagasse pulp at 55 per cent yield are given in Table IV.

Cost Summaries

A clearer picture of the comparative costs of the various pulps can be seen in Table V in which the costs are presented according to fibrous raw materials, chemical costs and operating costs. The major item in this presentation is always the fibrous raw material, and it can show a very great variation according to the yield of the pulp. The chemical cost differences between unbleached and bleached pulps run from about $5.50 to $8.50 per ton higher for the bleached pulps than for the unbleached pulps. The operating costs for the bleached pulps are from $9.00 to $10.75 higher than they are for unbleached pulps.

The estimated working capital and investment for 100-ton-per-day mills are given on the basis of dollars per ton per day. These estimates do not make any provision for steam and power. The location of the mill in our country as well as local conditions can make big differences in these figures. These estimates are given in Table VI.

Raw Material Picture

One of the serious pulping problems of the last decade has been to find a new fiber source to go along with the coniferous wood or to get higher yields from coniferous woods. While pulps can be made from straw and bagasse to fit into a variety of applications, they will not make much impression on the overall picture as long as wood costs remain as favorable comparatively as they are today.

Fortunately, some hardwoods, especially aspen, produce high yield pulps which have exhibited remarkable strength potentials when used by themselves and in combination with other pulps. Another glance at Table V shows that the aspen neutral sulphite, cold soda, and Chemigroundwood are in a good position to replace some of the longer fibered pulps from coniferous woods in some applications. It might be remembered that the sulphite and kraft processes have been in use longer than have the high yield processes and that we might expect more improvements in the latter than in the former in the immediate future. One of these improvements can be expected in the bleaching of high yield pulps where one may expect brighter pulps and higher yields than are presented in this analysis. This in combination with expected me-

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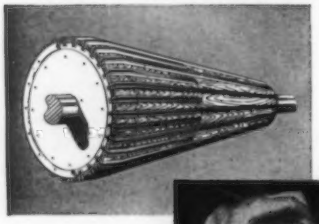
TIME FOR REPLACEMENT?

E.D. Jones Adapta-Plug



Strongest plug design yet developed, this new completely bandless Jordan plug is easiest to strip and fill. New, improved design holds bars firmly in place, eliminates hazards of slot wear and corrosion. Available in solid plug — or sleeve form for easy conversion of old worn plugs. Write for Bulletin EDJ-1094.

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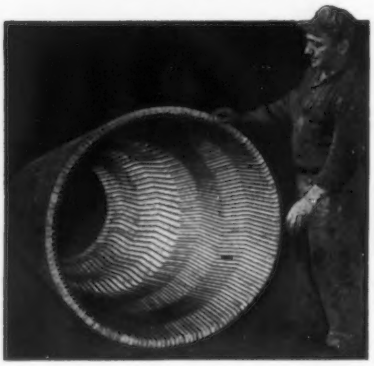

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chanical improvements will make the cost of high yield aspen pulps more attractive than they are at this time.

Technicians have shown that the hardwoods can be added to the softwood resources which have been guarded carefully from various destructive forces and have been replenished with new plantings following the harvesting of the wood. By combining the hardwood and softwood resources the pulp manufacturer is less concerned about the future source of papermaking fibers. The economic advantages in the use of high yield pulps from hardwoods if the expected improvements materialize will help the papermaker improve his position among the leading industries.

Based on a paper presented at the Second Annual Pulp and Paper Conference held at Western Michigan University, January 23, 1958 (See Paper Trade Journal February 3, 1958).

TABLE VI—INVESTMENT & WORKING CAPITAL PER A. D. TON PER DAY*

(100 ton mill basis)

Process	Investment	Working Capital
Groundwood—Unbleached	$22,500	$13,500
Groundwood—Bleached	29,500	
Cold Caustic Soda—Unbleached	22,500	14,500
Cold Caustic Soda—Semi-bleached	30,500	
NSSC—Unbleached	36,000	14,500
NSSC—Bleached	41,000	
Kraft—Unbleached	54,000	22,500
Kraft—Bleached	65,500	
Sulphite—Unbleached	45,000	22,500
Sulphite—Bleached	52,000	

* Plant site, steam, and power not included.

"Mrs. Jones says it's reported on good authority that you beat the stock here."

PRICES OF FIBERS

MARKET WOOD PULP

FIRST QUARTER CONTRACT PRICES PER SHORT AIR-DRY TON

Delivered Basis

	U.S.	Canadian	Swedish	Finnish	Norwegian
Groundwood	$82.50/ 90.00	$82.50/ 90.00	$$90.00/ —	$$90.00/ —	$$90.00/ —
Bleached Gw'd.	$97.50/100.00	$97.50/100.00			
Kraft, Blchd.	157.00/ —	160.00/162.50	$157.00/162.50*		$157.50/ —
Kraft, Blchd. Hdwd.	152.00/ —		$137.00/ —		
Kraft, Semi-bleached	140.00/ —	140.00/ —			
Kraft, Unbl.	117.50/125.00	125.00/130.00	†125.00/130.00	125.00/ —	
Sulphite, Blchd.	155.00/ —	155.00/ —	*155.00/ —	*155.00/ —	155.00/ —
Sulphite Bl. Hdwd.	150.00/ —				
Sulphite, Unblchd.	135.00/ —	135.00/ —	†135.00/ —	*130.00/ —	
Sulphite, Unb'l. Gl'sn		134.00/ —	†134.00/ —		
Soda, Blchd.	147.00/150.00	150.00/ —			

§ On Dock Atlantic Ports. * Freight allowed. † Varying Freight Allowances

NEW YORK RAG MARKET

New Domestic Cotton Cuttings

Delivered Mill Basis

PRICES NOMINAL

	Per 100 lbs.
No. 1 White Shirts	$13.50/$15.00
No. 1 Unblchd. Muslins	16.50/ 17.50
Blchd. & Unblchd. Underwears	15.50/ 16.75
No. 1 Light Silesias	6.75/ 7.25
No. 1 Light Blue Overalls	7.00/ 7.50
Percales	6.00/ 6.50
No. 1 Light Prints	5.00/ 5.25
Suntan Khakis	6.00/ 7.00
Cottonades	3.00/ 3.50
No. 1 Washables	2.50/ 2.75

Old Domestic Cotton Rags

(Prices to Dealers, f.o.b. Ship. Pt.)

	Per 100 lbs.
Mixed White	$3.00/$3.25
Cotton Pants & Overalls	2.00/ 2.25
Twos and Blues, Repacked	1.50/ 1.75
No. 2 Roofing	.50/ .60

COTTON LINTERS

Memphis Market

f.o.b. Oilmills

Week Ended February 27		Per 100 lbs.
Grade 1	n. a.	
2		
3		$9.75/ $8.50
4		8.00/ 7.50
5	1 cut—felting	7.00/ 6.00
6		5.50/ 5.00
7		5.00/ 4.50

*Based on 73% cellulose.

Old Rope & Bagging

(Prices to Dealers, f.o.b. N.Y.)

	Per 100 lbs.
New Burlap Cuts	$4.50/$5.50
Scrap Burlap	3.50/ 4.25
Australian Wool Pouches	5.00/ 5.50
Gunny	4.50/ 5.00
No. 1 Domestic Manila Rope	6.25/ 7.50
No. 1 Foreign Manila Rope	5.25/ 6.25
Domestic Sisal Strings	4.00/ 4.50

WASTE PAPER MARKET

Mill Prices, f.o.b. Trucks Shipping Point — Includes Brokerage

These quotations are a partial indication of the price range on volume tonnage in each market on the date specified, as gathered from major dealers. SPECIAL PACKINGS AND SPOT TONNAGE NOT INCLUDED. Prices nominal.

	New York	Boston	Chicago	Los Angeles
	March 3	March 3	March 3	March 3
No. 1 Mixed Paper	$5.00/ $8.00	5.00/ 7.00	4.00/ —	12.00/ —
No. 1 News	13.00/ 15.00	14.00/ —	16.00/ —	12.00/ —
Overissue News (Lg. size)	16.00/ 18.00	11.00/ 14.00	21.00/ —	16.00/ —
Mill Wrappers	11.00/ 13.00	12.00/ 14.00	7.00/ —	13.00/ —
Old Corrugated Containers	21.00/ 22.00	20.50/ 21.00	19.00/ —	20.00/ —
Super Resorted Kraft Paper	30.00/ 35.00	35.00/ 45.00	35.00/ —	45.00/ —
New Double Kr. Ld. Corr. Cuts	25.00/ 30.00	32.50/ —	32.50/ —	30.00/ —
(Semi-chem. medium)	40.00/ 45.00	37.50/ 45.00	40.00/ 45.00	35.00/ 45.00
New 100% Kraft Corr. Cuts	50.00/ 55.00	50.00/ 55.00	55.00/ —	45.00/ —
New Br. Kraft, Env. Cuts	65.00/ 70.00	70.00/ 75.00	55.00/ —	50.00/ 55.00
New Br. Kr. Bag Waste Prntd.	55.00/ 60.00	55.00/ 60.00	50.00/ —	45.00/ 50.00
New Br. Kr. Bag Waste Unprintd	60.00/ 65.00	65.00/ 75.00	55.00/ —	45.00/ 50.00
No. 1 Groundwood Shvs.	23.00/ 27.00	24.00/ 30.00	16.00/ —	25.00/ 30.00
White Newsblanks	50.00/ 55.00	50.00/ 57.50	35.00/ —	55.00/ —
No. 1 Soft White Shvs.	55.00/ 60.00	60.00/ 65.00	55.00/ —	— / —
Super Soft White Shvs.	65.00/ 75.00	75.00/ 85.00	65.00/ —	— / —
Hd. White Shvs.	90.00/ 95.00	100.00/110.00	90.00/ —	85.00/ 90.00
Hd. White Env. Cuts	115.00/125.00	120.00/130.00	100.00/ —	100.00/110.00
Col. Tab. Cards	50.00/ 60.00	55.00/ 62.00	47.50/ —	37.50/ —
Manila Tab. Cards	60.00/ 70.00	70.00/ 75.00	65.00/ —	75.00/ —
No. 1 Col. Ledger	28.00/ 30.00	30.00/ 32.50	40.00/ —	20.00/ —
White Ledger	45.00/ 50.00	47.00/ 52.00	52.50/ —	35.00/ —
Mixed Book & Mag.†	17.00/ 19.00	18.00/ 19.00	12.00/ —	— / —
No. 1 Books‡	25.00/ 27.00	22.00/ 24.00	27.50/ —	— / —

† Includes Time & Life; no coarse groundwood. ‡ Not to exceed 10% of groundwood.

PRICES OF MATERIALS

Aluminum sulphate:
- coml. bulk, c.l. wks. cwt. 2.00 / —
- iron-free, c.l. wks. cwt. 3.55 / —

Casein, acid prec.:
- dom. sh. pt. c.l. (30 mesh) cwt. 56.00 / —
- Arg. ex. dock cwt. 20.50 /21.50
- New Zealand cwt. 24.00 /25.50

Caustic soda:
- c.l. wks. solid, 76% cwt. 4.30 / —
- flak. & grd. drums, c.l. cwt. 4.70 / —
- liquid 50% tanks 2.90 /
- liquid 73% tanks 3.00 / —

China Clay
- dom., dry-grd., airfloat:
- 325 mesh bgs., c.l. Geo. ton 10.00 / —
- 300 mesh, bgs., c.l. Geo. ton 13.50 /14.50
- imp., white, lump, c.l. ex. dock 20.00 /35.00

Chlorine:
- single-unit tanks, works cwt. 3.15 / —
- multiple unit, 2-5 cars per yr. 5.25 / 4.05

Lime:
- hydrated, bulk, c.l. N.Y. ton 23.63 / —
- quicklime, bulk, c.l. N.Y. ton 22.13 / —

Gum rosin:
- K, M. N, drums, c.l. Savan, cwt. 7.70 / 7.80

Rosin size:
- 70%, gum & pale paste, tank cars, south, sh. pt. cwt. 7.38 / 7.48

Saltcake:
- dom. bulk, 100% anh. wks. ton 28.00 / —

Soda ash:
- light, 58% ash bags, wks. cwt. 1.85 / —
- bulk, c.l. wks. cwt. 1.60 / —

Sodium chlorate:
- drums, c.l., wks. cwt. 9.00 / —
- drums, l.c.l., wks. cwt. 9.50 /10.50

Sodium peroxide:
- dms., c.l. E. of Miss. lb. .20½/ —
- l.c.l. (same basis) .21 / .21½

Sodium silicate, 40° Be.:
- tank-cars, wks. cwt. 1.20 / —
- drums, c.l. wks. cwt. 1.55 / —
- 47° Be. WW.
- tank-cars, c.l. wks. cwt. 1.90 / —
- drums, c.l. wks. cwt. 2.25 / —

Soybean, protein:
- chem. isol., wks. c.l. bags lb. .23 / —

Starches:
- Corn, multiwalls, c.l. prod. plant:
- pearl cwt. 6.49 / 6.75
- white, dextrins cwt. 8.08 / 8.20
- chlorinated cwt. 8.25 / 8.35
- potato, Idaho, c.l. wks. cwt. 6.35 / —
- East, fr. all. 50 cents cwt.
- potato, Maine, f.o.b. wks. cwt. 6.25 / —

Sulphuric acid:
- 60° Be. cbys. c.l. wks. cwt. 2.00 / —
- l.c.l. wks. cwt. 2.45 / —
- tank-cars, wks. ton 18.60 / —

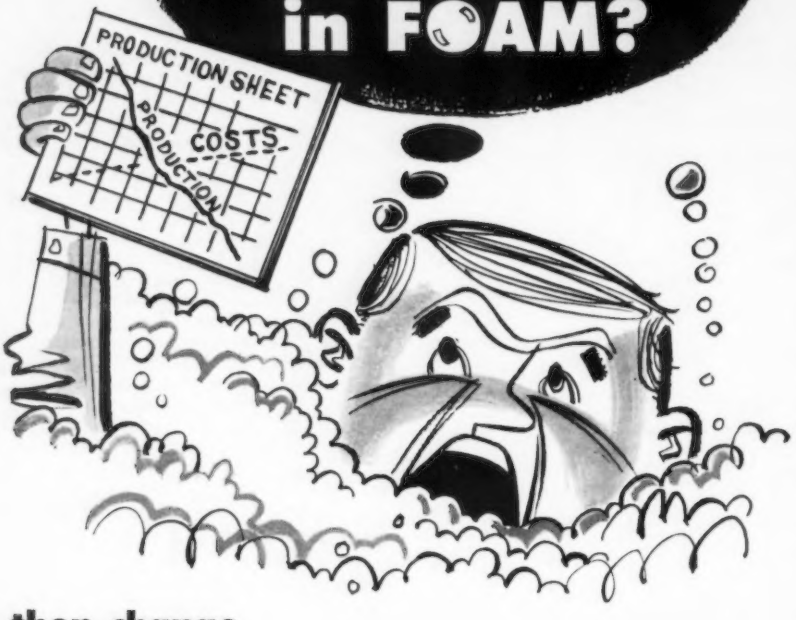
Sulphur:
- crude, c.l. mines, contract, long ton 23.50 / —
- f.o.b. vessels Gulf dock ton 25.00 / —

Sulphur dioxide:
- liquid, coml. cyl., wks. lb. .10 / .12
- multi-unit cars, wks. lb. .0535/ —

Talc, fibrous grd., bags:
- c.l. wks., N.Y. ton 28.00 / —
- l.c.l. wks., N.Y. ton 31.00 /36.00

Titanium dioxide:
- anstase, c.l. dlvd. E. bags lb. .25½/ —
- l.c.l. dlvd. lb. .26½/ —
- rutile, c.l. dlvd. lb. .27½/ —
- l.c.l. dlvd. lb. .28½/ —

up to your ears in FOAM?



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1 OUNCE KILLS FOAM IN:

1,250 lb Printing Ink

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NAME _____

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My foamer is

Oil system _____

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Other _____

OBITUARIES

J. Gilbert D'Aoust died in Vancouver, B. C. on February 25. At the time of his death he was plant engineer for Powell River Co., Powell River, B. C. Previously he was project engineer in charge of the major expansion program involved around the new number nine paper machine there. Mr. D'Aoust was widely known in the Canadian industry, having worked for Consolidated Paper Corp. and Price Bros. in the East and British Columbia Pulp & Paper Co. and Sorg Paper Co. on the Pacific, as well as two extended periods of employment with Powell River Co.

Edwin A. Meyer, 66, chairman of the board of Badger Paper Mills, Inc., Peshtigo, Wis., died of a coronary at his home in Menominee, Mich. on February 23.

He became associated with the paper industry in 1905 at Kimberly-Clark Corp., Neenah, Wis., as an office boy. In 1917 he joined Menasha Printing & Carton Co., which later became Marathon Corp. In 1923 he was appointed vice president and general manager of this organization which position he held until 1929, when he founded Badger Paper Mills, Inc.

Henry M. Ostertag, inventor of a facial tissue and for more than 18 years director of mechanical development for the Scott Paper Co., Chester, Pa., died February 16. Mr. Ostertag created the facial tissue for the Kimberly-Clark Corporation. He was associated with the Scott Co. from 1940 to 1955.

Harry C. Fisher, 57, consultant to the technical department of the Gardner Division of the Diamond Gardner Corp., Lockland, Ohio, died February 14. He had been with the firm since 1920.

NEWS OF SUPPLIERS

F. C. Arnold
Pusey & Jones

F. R. Convey
Bolton & Sons

Pusey and Jones Corp. has appointed Frank C. Arnold sales engineer. He will represent the corporation's paper machinery division in the New England and northern New York territory. He will make his headquarters in Henderson Harbor, New York.

John W. Bolton & Sons, Inc. and The Emerson Manufacturing Co. Division has appointed F. Richard Convey as northeastern regional manager.

The formation of the Northeastern Region, which includes New England, New York, New Jersey, Pennsylvania, Maryland and Delaware, completes a sales department reorganization program begun two years ago.

W. L. Reilly
Huyck

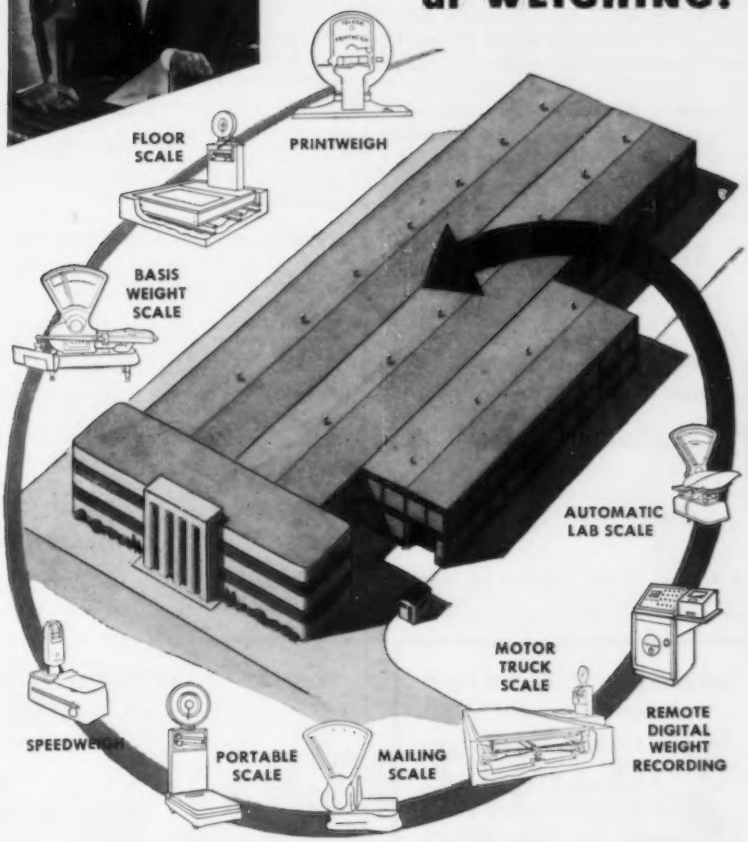
D. H. Montville
Black-Clawson

Huyck Felt Co., division of F. C. Huyck and Sons, Rensselaer, N. Y., has added William L. Reilly to its chemical research department. Dr. Reilly was previously engaged in chemical research at the Mellon Institute in Pittsburgh.

Black-Clawson Co. has appointed Don H. Montville vice president in charge of sales of its Shartle Division, Middletown, Ohio. Mr. Montville has been sales manager of the Shartle Division, which manufactures pumps, jordans and other paper mill stock preparation equipment.

Studying Costs? It pays to start with a

Plant-Wide Look at WEIGHING!



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Chemical Linings Inc., Watertown, N. Y. has named Warren K. Brown, with the company since 1952, its chief engineer. Alan T. Ganham, who joined the company's engineering department in 1955, has been appointed assistant to the president.

Lee W. Douglas has been named manager of Chemical Linings de Mexico S.A. de V.V., new Mexican subsidiary with headquarters at Avenida Marina Nactional 200, Mexico 17, D.F.

Monsanto Chemical Co. has purchased the physical assets of Filtered Rosin Products Inc., Baxley, Ga., a manufacturer of paper size and other gum rosin products. The acquisition will continue to operate as a separate and newly formed Filtered Rosin Products company employing the personnel of the former company.

Robert M. Morris of St. Louis, assistant general manager of Monsanto's Organic Chemicals Division which made the purchase, has been elected president of the new company in addition to his Monsanto duties. John S. Laws of Baxley, Ga., vice president and general manager of Filtered Rosin Products Inc. continues in these capacities in the new company.

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Figures of the Week

PAPER PRODUCTION RATIO REPORT—American Paper & Pulp Assn. Figures

(Production as percent of normal capacity)

COMPARATIVE WEEKLY SUMMARIES

	Jan. 25	Feb. 1	Feb. 8	Feb. 15	Feb. 22
1958	89.1	85.4	87.4	88.4r	87.2
	Jan. 26	Feb. 2	Feb. 9	Feb. 16	Feb. 23
1957	97.9	96.5	96.7	98.0	97.7

r Revised.

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1958	85.5‡	—	—	—	—	—	—	—	—	—	—	—	—
1957	94.2	97.0	97.1	94.0	94.6	93.3	75.6	90.7	86.0	93.0	90.7	81.4‡	90.9

‡ Preliminary.

COMPARATIVE YEARLY SUMMARIES

	1951	1952	1953	1954	1955	1956	1957	1958
Year to Date	100.0	97.8	95.2	94.3	93.9	101.1	95.4	86.3
Year Average	98.0	88.6	92.3	91.6	94.0	97.9	90.9	

All of the above data is based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available.

PAPERBOARD OPERATING RATIOS†—National Paperboard Ass'n.

COMPARATIVE WEEKLY SUMMARIES

	Jan. 25	Feb. 1	Feb. 8	Feb. 15	Feb. 22
1958	87	82	83	86	89
	Jan. 26	Feb. 2	Feb. 9	Feb. 16	Feb. 23
1957	96	94	94	94	93

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1958	80†	—	—	—	—	—	—	—	—	—	—	—	—
1957	91	94	94	92	93	91	72	94	91	97	92	79	90

† *Percents of operation based on "Inch-Hours" reported on a 6-day basis.*

SUMMARY OF PAPERBOARD STATISTICS—National Paperboard Assn. Figures

ITEM	THIS WEEK ENDING Feb. 22, 1958 89%	LAST WEEK ENDING Feb. 15, 1958 86%	CUMULATIVE TO DATE Jan. 1 to Feb. 22, 1958 85%
	Tons	*Tons*	*Tons*
Total Production	272,590	259,233	1,912,388
Liner	90,934	89,821	618,399
Corrugating Material	39,762	38,062	283,943
Chip & Filler Board	4,182	5,179	29,748
Total Container Board	134,878	133,062	932,090
Folding	54,808	50,282	380,933
Set-Up	9,559	9,545	73,365
Special Food Board	26,988	22,123	174,329
Other	46,357	44,221	351,671
Total Boxboard	137,712	126,171	980,298
Total Orders	*Tons*	*Tons*	
Received	230,020	238,539	
Unfilled End of Week	330,479	373,522	

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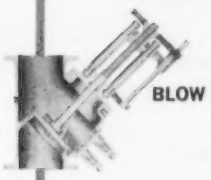

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Subsidiary of **NATIONAL LEAD COMPANY**
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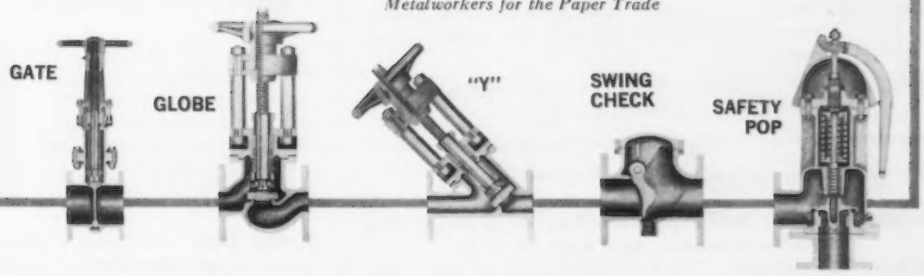
Metalworkers for the Paper Trade



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Kraft Papers . . . Bag, multi-wall sack, envelope, asphalting, gumming, interleaving, waxing.

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Mill located in metropolitan area.

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1—Knowlton 60" lap tube roller 4 ply.

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1—Dowingtown 99" single cyl. wet end comp. w/18" dia. couch etc.
1—Beloit 7 cyl. 132" wet end comp. Cyl. 36" dia. Couches 18" dia. Includes 4 sets primary & main presses.

CYLINDER MOLDS

1—72" face x 48" diameter.
1—73" face x 48" dia.
1—74" face x 36" dia.
1—92" face x 30" dia.
1—102" face x 36" dia.
2—104" face x 36" diameter.
1—107" face & 48" dia.—A.F. brgs
2—111" face x 36" dia.—A.F. brgs.
2—132" face x 36" dia.—A. F. Brgs.
1—132" face x 42" dia.—A. F. Brgs.
1—136" face x 54" dia. stainless steel covering.

DRIVES

46—Inclosed RT. Angle and parallel. Reeves, P.I.V., etc. 2 H.P.—150 H.P.

DRYERS—HYDROSTATICALLY TESTED

2—42" face x 36" dia.
2—44" face x 36" dia.
2—46" face x 16" dia. & accessories.
2—46" face x 36" dia.
40—46" face x 24" dia. chrome plated
58—46" face x 48" dia. chrome plated
1—52" face x 48" dia., gear bearings.
1—67" face x 36" dia.
1—68" face x 36" diameter.
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1—82" face x 48" dia., gears & bearings.
2—84" face x 28" dia.
2—88" face x 36" dia.
5—88" face x 48" dia. w/ace.
1—90" face x 18" dia. with A-F bearings.
9—90" face x 48" dia. with gears & bearings.
41—94" face x 48" dia. Complete section.
10—101" x 48" diam. Complete section.
1—104" face x 36" dia.
1—110" face x 42" dia.
1—120" face x 42" dia.
1—130" face x 48" dia.
1—138" face x 36" diameter.
2—160" face x 28" dia. with rope carriers.
10—160" face x 36" dia.
1—160" face x 42" dia.
14—160" face x 48" dia.

EMBOSSERS

1—80" Hudson Sharp A.F. Bearing equipped.

EXTRACTOR ROLLS

1—Downingtown 24" x 134" plain extractor with 18" x 136" R.C. couch roll.

FILTERS

1—Oliver continuous filter, cylinder 8 ft. diameter x 10 ft. face, steel vat. Used 2 months.

FLAT SCREENS

1—Impco 10 Plate—Dunbar drive, bronze vat.
1—12 plate Sandy Hill, Roller Shoe.
7—Beloit 12 plate—Witham Fasteners.
2—IMPCO 12 plate—w/Braemer controls.

JORDANS

1—Appleton #2 anti-friction bearings.
1—Smith & Winchester with granite filling.
1—E. D. Jones #4 (Imperial) with A. F. brg.
1—N & W Mammoth, Jr.
1—N & W Monarch.
1—N & W Bulldog half inch bars.

LABORATORY EQUIPMENT

Valley Iron Wks. pulp test equipment consisting of couch roll, sheet mould, hydraulic press, hot plate with boiler. Like new condition.

MOTORS

1—300 H.P. West. 388 RPM, 440-3-60.
1—GE 350 H.P. syn. 3/60/2200—720 R.P.M.
3—GE 150 H.P. 3/60/440—435 R.P.M.
3—GE 100 H.P. 3/60/440—435 R.P.M.
1—GE 100 H.P. 3/60/440 695 R.P.M.

PULP EQUIPMENT

3—2 ft. x 8 ft. type Tyler screens.
1—Jones pulp screen. Cylinder 40" dia. x 83".

PUMPS

44—Centrifugal Pumps open & closed impellers.
7—Beloit 8" x 10" Fan Pumps.

REELS

1—Kohler 100" 2 arm unwind Reel. Accommodates 60" dia. rolls. Completely automatic. Equipped with splicer. New condition.
1—Bagley Sewall Pope Reel—Drum 150" face x 36" dia. Complete with Reliance Drive.
1—Downingtown 94"—2 bowl—60" rolls.

REFINERS

1—34" Sutherland disc refiner, late model.
1—24" Downingtown Weiner refiner. New.
1—Diltz classifiner w/spare discs.
1—#1 Clafin Refiner. Anti friction bearing.

ROLL GRINDERS

1—Farrel Birmingham — complete with motor drive. For rolls 30" x 160".

ROLLS—PRESS, COUCH, CALENDER, ETC.

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24—153" face x 5" dia. S.S. table rolls.
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1—#2A Bird with copper vats.
12—3A Model 100 Bird S. S. or copper vats.
1—Jones 40" #2 Rotary Screen.

SHEETERS

1—Kidder 65" Spot Sheeter with elec. eye.
1—Hamblet 72" single knife with layboy.
1—Hamblet 30" with 6 roll backstand.
1—B.C. 80" heavy duty Duplex board cutter.
1—M & W 80" with backstand.
1—82" Hamblet Single Knife with layboy.
1—Hamblet 100" single knife with layboy.
1—Hamblet 110" single knife sheeters.
1—M.&W. 114" Single Knife with Layboy.
1—Cameron 124" quick change slitter assembly.
1—Downingtown 124" h.d. duplex board cutter.
1—Hamblet 87" Duplex w/layboy and overlapper.

SHREDDERS

2—Mitts Merrill air fluff paper shredders.
1—Taylor Stiles giant stock Shredder style 36.

SLITTERS & WINDERS

3—Shultz 12" coreless rewind.
1—Cameron 30" Model 6 w/motor.
1—Fales 40" Model B 1" and 1¼" knives.
1—Essex 42" duplex—30" diameter rewind.
3—Cameron 42" model 6.
1—Cameron 42" Model 40-1A—22" rewind.
1—Hudson Sharp 48" Wax Paper Converter.
1—Cameron 52" Model 24-3A, duplex rewind.
1—Cameron 52" Model 26-7 Duplex.
1—Langston 60" Shear Cut Slitters.
1—Hudson Sharp 60"—for plastic coated papers.
1—Hudson Sharp 60" Wax Paper Converter.
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2—Cameron 62" Model 6. 24" rewind.
1—Cameron 62" Model 9-5.
3—Cameron 62" Model 8—heavy duty.
1—Cameron 72" Model 26-2A.
1—Hudson-Sharp 72" high speed automatic.
1—Warren 94" Machine winder—60" rolls.
1—Cameron 92" Model 10-11A, A.F. brgs.
1—Cameron 194" model 19, A.F. brg.

STEAM TURBINE

1—De Laval 100 H.P. Complete incl. reducer.

SUCTION COUCH ROLLS

1—Sandusky 22" diameter x 135" drilled face.
1—Sandusky 18" diameter x 116" drilled face.
1—Sandusky 25" diameter x 122" drilled face.
1—Sandusky 18" diameter x 122" drilled face.
1—Millspaugh 30" diameter x 192" drilled face.

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1—Millspaugh 30" dia. x 194" drilled face.
1—Downingtown 112" drilled face x 24" dia.

SUPER CALENDERS

2—Norwood 58", 13 roll glassine stacks.
1—Norwood 80", 10 roll w/motor.

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1—Thickener, Cylinder 92" face x 36" diameter, with R. C. Couch.

TRIMMERS—POWER BACK GAUGES

1—Seybold 45" model 10 Z.
1—Seybold 56" Dayton with motor.
1—Seybold 84"—Dayton with motor.
1—Seybold 50" Precision Model 10-ZD.
1—Seybold 84" Model 12-Z.
1—Sheridan 65" with motor.

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1—Nash #8 Hytor.
1—Connersville 7 x 10.
1—Nash H-8

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1—New Valley Iron Works 156" x 36" monel lined inlet and head box.
1—Bagley and Sewall 144" stainless steel clad high speed inlet and head box.

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1—Beloit 12' diameter x 140" face 75 #S.P.

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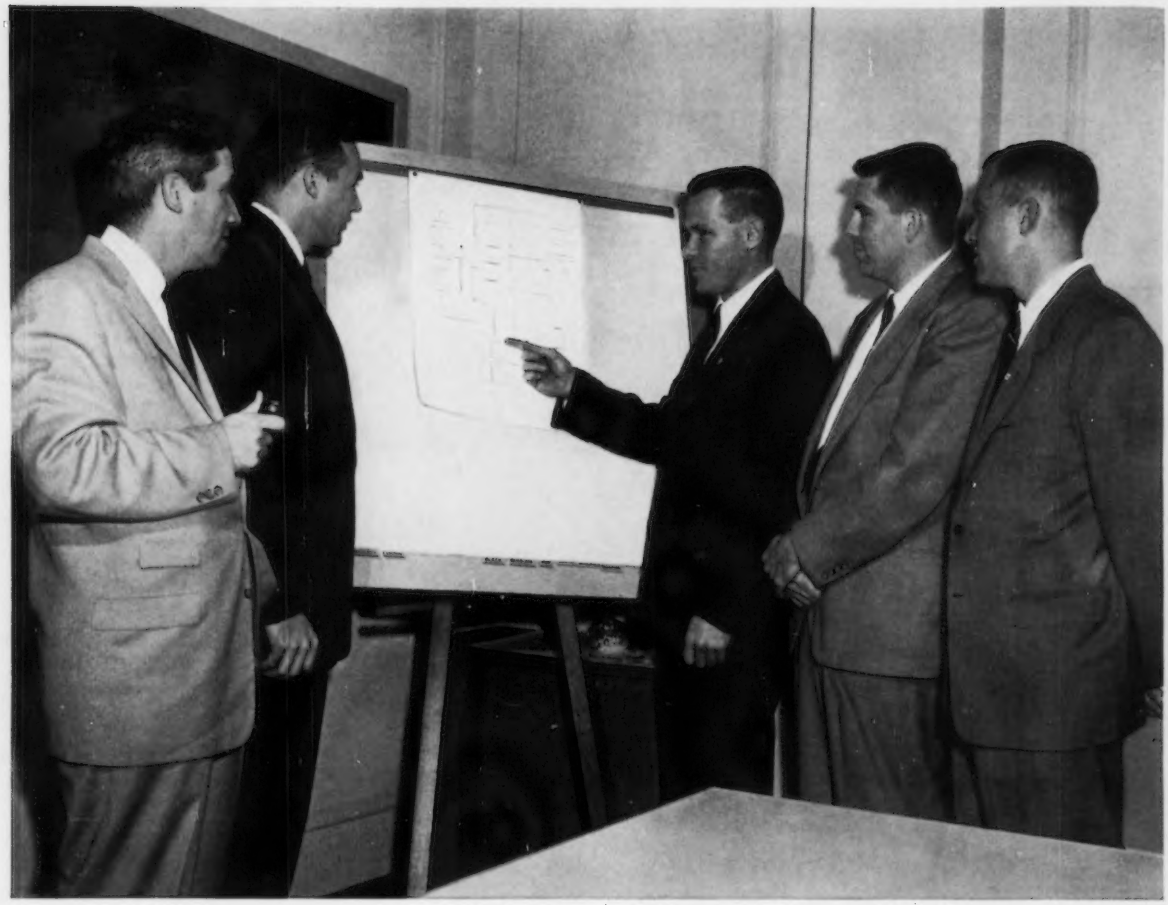

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